



CIVIL | WATER | ENVIRONMENT

24-28 MIDDLE HARBOUR ROAD, LINDFIELD – FLOOD IMPACT RISK ASSESSMENT

JUNE 2026

PREPARED FOR
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LIST OF ABBREVIATIONS

AEP	Annual Exceedance Probability
ARR	Australian Rainfall & Runoff
DCP	Development Control Plan
FERP	Flood Emergency Response Plan
FFL	Finished Floor Level
FIRA	Flood Impact Risk Assessment
GSDM	Generalised Short-Duration Method
LGA	Local Government Area
LiDAR	Light Detection and Ranging
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SEARs	Secretary's Environmental Assessment Requirements
TP	Temporal Pattern

1 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

WMS Engineering has been engaged by Xavier Knight to prepare a Flood Impact Risk Assessment (FIRA) to support the proposed development at the 24-28 Middle Harbour Road, Lindfield (the subject site). This report has been prepared in accordance with the secretary's environmental assessment requirements (SEARs) and the relevant NSW flood planning requirements including the NSW Flood Risk Management Manual and FIRA Guideline, as well as taking into account Ku-ring-gai Council's DCP.

The subject site is located at 24-28 Middle Harbour Road, Lindfield, approximately 11 km north of the Sydney CBD, within the Ku-ring-gai Council Local Government Area (LGA) in NSW. The site location is illustrated in **Figure 1-1**.

The proposed development at the site involves the construction of an 8-storey residential apartment. The site is located within the Middle Harbour Southern Catchment. According to the Middle Harbour Southern Catchments Flood Study (BMT, 2023), herein referred to as the 2023 Flood Study, there is an overland flow path travelling diagonally from the west to the southeastern corner of the site. Given the existing flood risk of the development, a FIRA is required to support the development and inform the design. This FIA addresses the following items:

- Modelling of pre-development flood behaviour in the 10%, 5%, 1%, 0.5%, 0.2% AEP and Probable Maximum Flood (PMF) events;
- Modelling of post-development flood behaviour in the 10%, 5%, 1%, 0.5%, 0.2% AEP and PMF events;
- Mapping of peak flood depths, velocities, water surface contours, depth*velocity products and hazard (H1 to H6) for the pre- and post-development conditions;
- Assessment of development impacts on local flood behaviour;
- Assessment of flood emergency management;
- Assessment of proposed development against Council's flood planning requirements.

1.2 STUDY AREA AND TOPOGRAPHY

The subject site is located in Lindfield, NSW, approximately 200 m upstream of Gordon Creek and 200 m east of the railway line. The site is currently zoned as R2 Low Density Residential. The surrounding environment is characterised by a mix of heritage-listed houses and natural landscapes, including proximity to several creeks that feed into Middle Harbour.

The study area topography is illustrated in **Figure 1-2**. The local topography is characterised by hills to the west and south of the site, which creates catchments from the Pacific Highway draining generally east. The elevations within the site vary from approximately 87.5 mAHD in the northeastern corner to approximately 80.7 mAHD in the southeastern corner, resulting in a steep slope through the site.

1.3 PROPOSED DEVELOPMENT

The proposed development plan is illustrated in **Figure 1-3**. The development consists of the demolition of the existing dwellings and construction of an 8-storey residential apartment.



Figure 1-1 Site Location

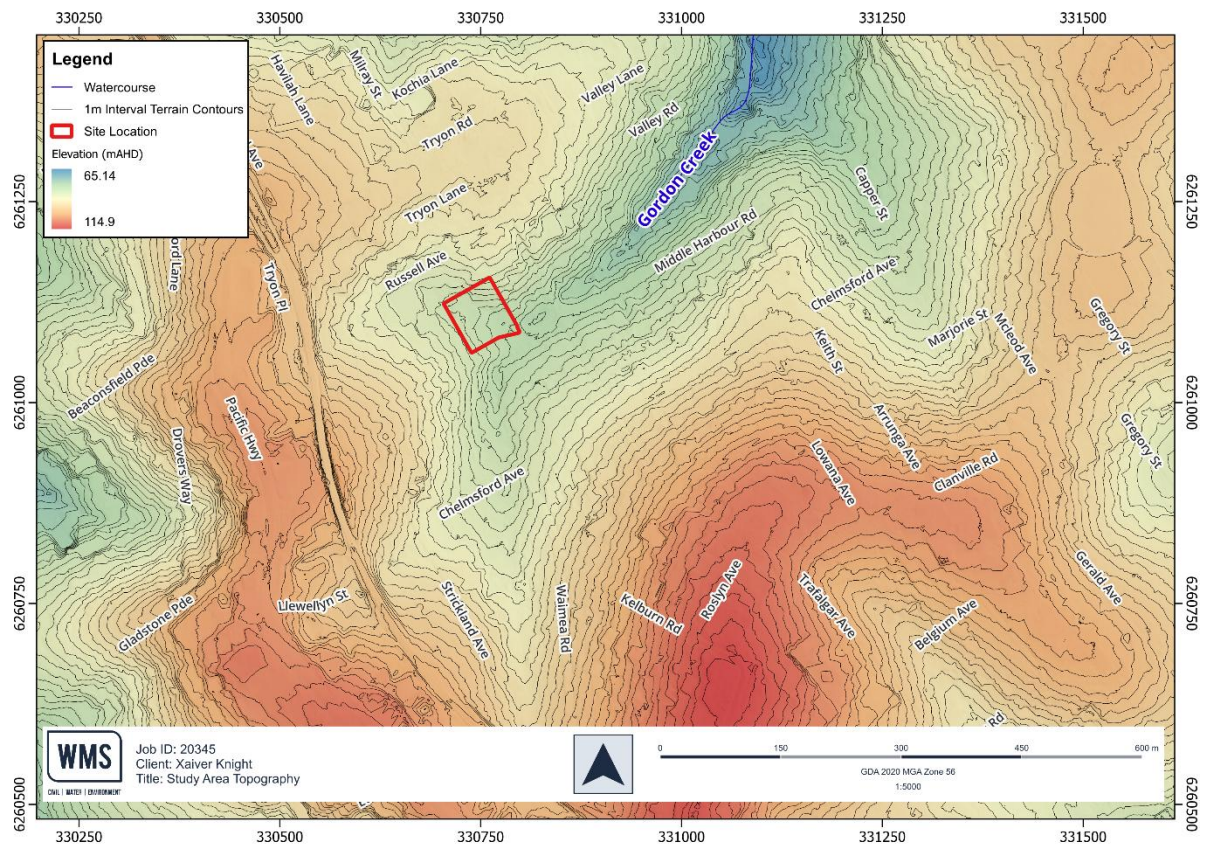


Figure 1-2 Study Area Topography

1. This drawing is a site plan for the proposed development. It shows the layout of the building, parking areas, and landscaping. The drawing is a plan view and does not show the building's elevation or section. The drawing is a plan view and does not show the building's elevation or section. The drawing is a plan view and does not show the building's elevation or section.

No.	Rev.	By	CHK	Description
1	01	WMS	WMS	Initial Design
2	02	WMS	WMS	Revised Design
3	03	WMS	WMS	Final Design



Scale: 1:1000
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DKO
PROJECT: 20345-R01-24-28MiddleHarbourRdLindfieldFIA-3.docx
PROJECT NO: 20345-R01-24-28MiddleHarbourRdLindfieldFIA-3.docx
PROJECT NAME: 20345-R01-24-28MiddleHarbourRdLindfieldFIA-3.docx
COUNTY: 20345-R01-24-28MiddleHarbourRdLindfieldFIA-3.docx

Ground
DA203
04

Figure 1-3 Proposed Ground Floor Plan (DKO, Rev 04, 05/12/2025)

2 AVAILABLE DATA

Table 2-1 provides a summary of datasets available and used to inform the assessment.

Table 2-1 Available Data Summary

Data Category	Available Datasets	Source
GIS Layers	Cadastre	NSW SIX Maps
	Road corridor	NSW SIX Maps
	Road centrelines	NSW Spatial Collaboration Portal
	Watercourse centrelines	NSW Spatial Collaboration Portal
	Building footprints	Bing Maps
	Drainage Network	Ku-ring-gai Council
Aerial/Satellite Imagery	Aerial imagery taken on the 3 rd of April 2025	Nearmap
Topography	1 m resolution LiDAR surveyed in 2013 and 2020	NSW Government – Spatial Services
	Detailed site survey (13/08/2024)	CMS Surveyors
Design Documentation	Architectural Drawings (Rev 04, 05/12/2025)	DKO
Previous Studies	Middle Harbour Southern Catchments Flood Study 2023	BMT
Guidelines	Council's Development Control Plan 2024	Ku-ring-gai Council
	Council's Local Environmental Plan 2015	Ku-ring-gai Council
	Australian Rainfall & Runoff (ARR) 2019	Commonwealth of Australia (Geoscience Australia)

3 FLOOD MODELLING

3.1 MODELLING APPROACH

A local, site-specific flood model was developed by WMS to inform the overland flow assessment at the site. The model was developed in accordance with ARR 2019 guidelines, and consisted of a TUFLOW hydraulic model utilising a rain on grid approach whereby rainfall was applied directly to the model terrain. A summary of the model development is provided below.

3.2 HYDROLOGIC MODELLING

3.2.1 Design Rainfall

Design rainfall data was extracted from the ARR Data Hub using the TUFLOW ARR plugin tool for QGIS. The tool interfaces directly with the ARR2019 Data Hub and obtains the relevant hyetographs based on the catchment shapefile input and the requested events, durations, temporal patterns, and other parameters such as losses and spatial patterns. The centroid of the upstream catchment was used as an input to the ARR Data Hub (Lat -33.7782, Long 151.17285).

In their RFI dated 2nd July 2025, CPHR noted that an at-site rainfall analysis was used for Ku-ring-gai Council's Middle Harbour Southern Catchments Flood Study (BMT, November 2024) and recommended that the IFD rainfall depths used in the 2024 study be adopted for this FIRA. Comparison between the 1% AEP rainfall data from the 2024 study and the 0.2% AEP rainfall data used in this FIRA shows a difference of rainfall (mm) of approximately 2%. As such, the 0.2% AEP has been used as a proxy for the 1% AEP event with rainfall data from the 2024 BMT study for the purpose of setting out flood planning levels.

Probable maximum precipitation (PMP) is not available through the TUFLOW ARR plugin tool for QGIS nor the BOM website. To calculate PMP, the Generalised Short-Duration Method (GSDM) was used. This method is based on an analysis of convective thunderstorms and is appropriate for durations up to 6 hours (360 minutes). The GSDM PMP rainfall calculation procedure followed the instructions detailed in 'The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method' (BOM, 2003). PMF historical temporal patterns were based on the paper 'Growth curves and temporal patterns of short duration design storms for extreme events' (Jordan, 2005). This methodology is in line with ARR Guidelines, which recommend the use of Jordan temporal patterns for extreme event modelling.

The adopted design rainfall is provided in **Table 3-1**.

Table 3-1 Adopted Design Rainfall (Bureau of Meteorology)

Duration (min)	Rainfall Depth (mm)					
	10% AEP	5% AEP	1% AEP	0.5% AEP	0.2% AEP	PMP
10	22.8	26.2	34.5	37.2	42	110
15	28.5	32.8	43.1	46.5	52.6	170
20	32.7	37.6	49.4	53.3	60.3	200
25	35.9	41.3	54.3	58.7	66.4	220
30	38.5	44.3	58.3	63.1	71.4	250
45	44.5	51.1	67.4	73.1	82.7	320
60	48.9	56.2	74.3	80.6	91.2	380
90	55.9	64.2	85.2	92.4	105	430
120	61.6	70.9	94.4	102	116	480
180	71.4	82.4	110	119	135	540
270	84.2	97.5	131	141	159	620
360	95.6	111	150	161	181	670
540	116	135	183	196	221	N/A
720	134	156	213	228	257	N/A

3.2.2 Temporal Patterns

The site is situated in the East Coast South temporal pattern region as defined in the ARR 2019 (refer **Figure 3-1**). The temporal patterns for this region were extracted using the ARR Data Hub website and have been adopted for the analysis. As the total catchment area was less than 75 km², point temporal patterns were used, as recommended in ARR 2019.

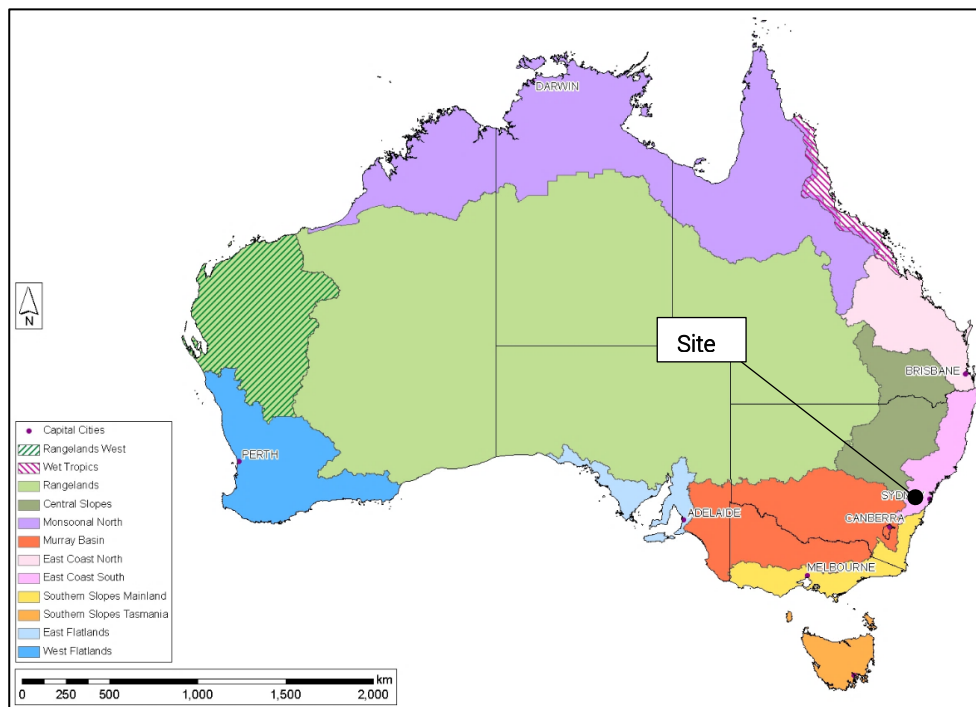


Figure 3-1 Temporal Pattern Regions (ARR 2019)

3.2.3 Rainfall Losses

Rainfall losses were extracted from the ARR Data Hub and adopted for the study. As recommended in the *Review of ARR Design Inputs for NSW* (NSW Office of Environment & Heritage, 2019), probability neutral losses were adopted as burst initial losses and the continuing loss obtained from the ARR Data Hub was multiplied by a factor of 0.4.

The losses adopted for the study are summarised in **Table 3-2**.

Table 3-2 1% AEP Adopted Rainfall Losses

Storm Duration (min)	Probability Neutral Burst Initial Loss (mm)	Continuing Loss (mm/h)
10	6.6	0.4 x 1.8 = 0.72
15	6.6	
20	6.6	
25	6.6	
30	6.6	
45	6.6	
60	6.6	
90	7.0	
120	6.0	
180	4.3	
270	4.0	
360	3.7	

3.3 HYDRAULIC MODELLING

3.3.1 Modelling Software

A 2D TUFLOW hydraulic model was developed to determine the flood behaviour at and around the site. TUFLOW is widely used in Australia for flooding and drainage studies. The recent TUFLOW version (2025.2.2) has been adopted for this study.

3.3.2 Model Extent, Terrain and Resolution

The model extent was delineated to capture the entire site, its upstream catchment and any areas downstream that may be impacted by the proposed development.

Based on the 2023 Flood Study, the 2013 LiDAR data was considered a better match with the ground survey compared to 2020 LiDAR data. Therefore, the model topography was developed based on 1 m resolution LiDAR data (NSW Spatial Services, 2013). A detailed survey of the site (13/08/2024) was included in the model to accurately represent the pre-development scenario. A consistency check was undertaken to ensure survey elevations were generally in line with LiDAR elevations.

To represent the post-development scenario, terrain modifiers were used to fill in the existing swimming pool and depressions on the site. The proposed swales along the western and southern boundary were incorporated as per civil design. The building footprints in the pre-and post-development scenarios were represented as solid obstructions as per the 2023 Flood Study suggested.

Given a fairly small catchment size, a base resolution of 1 m was selected for the model. This grid size allows for appropriate representation of the various flow paths, road crests and embankments within the study area without producing excessive run times.

The pre- and post-development TUFLOW model extents are illustrated in **Figure 3-2**.

3.3.3 Boundary Conditions

3.3.3.1 Inflow Boundaries

The hyetographs extracted from the ARR Data Hub were applied to the TUFLOW model as 2D boundary condition using a '2d_rf' polygon. The pre- and post-development model inflow boundaries are illustrated in **Figure 3-2**.

3.3.3.2 Outflow Boundaries

An outflow boundary condition was applied to the TUFLOW model to allow flow to exit the study area. The outflow boundary was at the upstream of Gordon Creek and placed sufficiently downstream of the site to ensure that flood behaviour within the study area was not affected by the boundary assumptions. A 'constant water level' boundary was used to simulate the more conservative scenario that the downstream network is full. According to the 2023 Flood Study, 1% AEP flood event level of 71 mAHD was adopted for the constant water level for all modelled events.

The pre- and post-development model outflow boundary is illustrated in **Figure 3-2**.

3.3.4 Suspended Construction

In the post-development model, areas where suspended construction is proposed (i.e. balconies, elevated walkway and stairs at the front) were modelled using a layered flow constriction. A blockage of 20% was applied to these areas to account for the obstruction from the suspended construction elements and additional obstruction from potential debris.

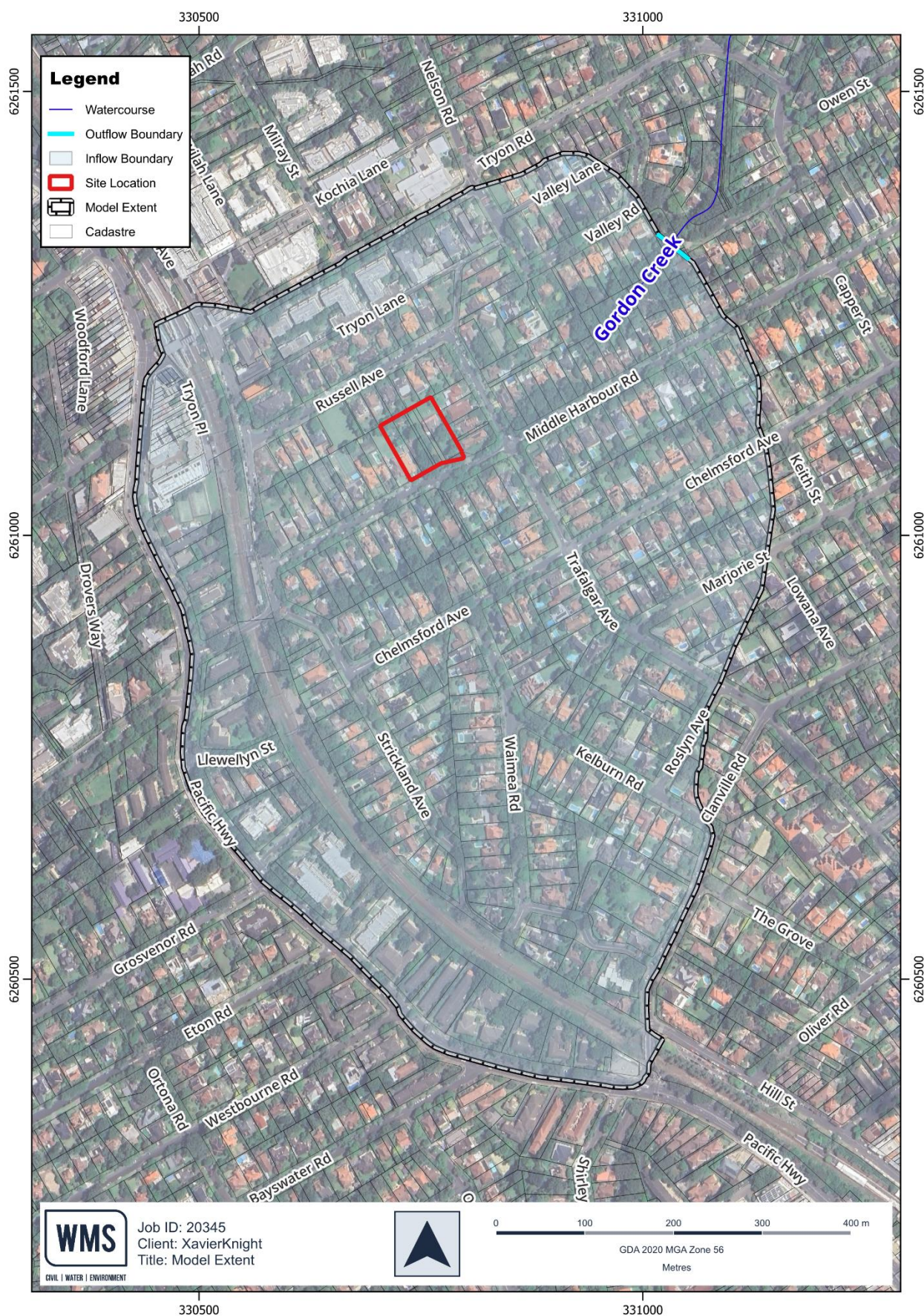


Figure 3-2 TUFLOW Model Extent and Boundary Conditions

3.3.5 Hydraulic Roughness

The hydraulic roughness (Manning's 'n') values used in the TUFLOW model are outlined in **Table 3-3**. These values are consistent with the 2023 Flood Study and are in line with ranges outlined in Book 6 of ARR 2019. The spatial distribution of roughness was delineated based on the local land zoning and inspection of aerial imagery and is illustrated in **Figure 3-3** and **Figure 3-4** for pre- and post-development, respectively.

Table 3-3 *Adopted Hydraulic Roughness Values*

Land Use Type	Adopted Manning's 'n'	Impervious Fraction (%)
Low Density Residential Lots (Excluding Building Footprints)	0.08	40
Roads	0.02	100
Railway	0.05	100
Riparian Zone	0.1	0
Light Vegetation	0.04	0
Moderate Vegetation	0.06	0
Dense Vegetation	0.12	0
High Density Residential/Commercial	0.035	80

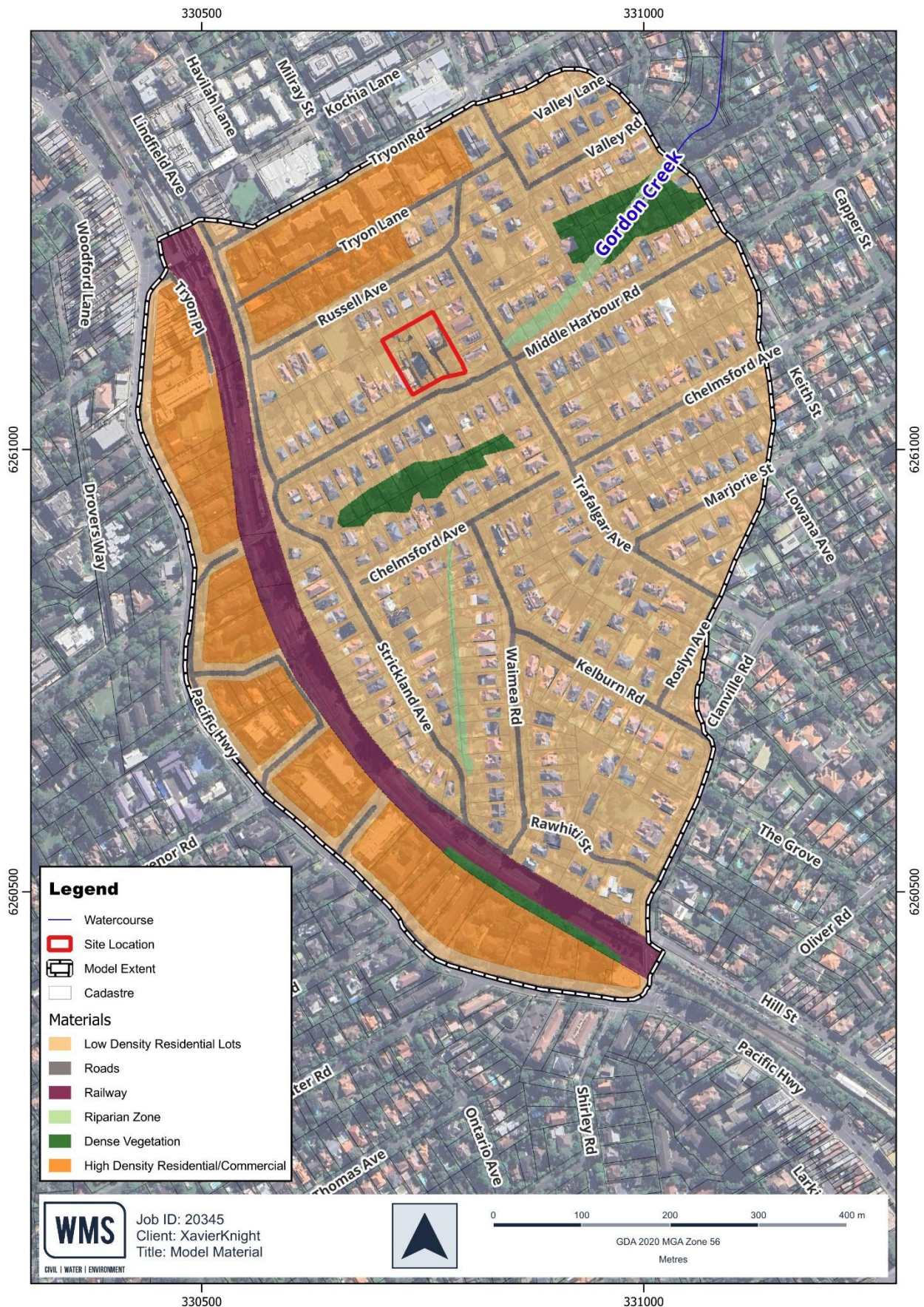


Figure 3-3 TUFLOW Model Roughness Distribution – Pre-Development

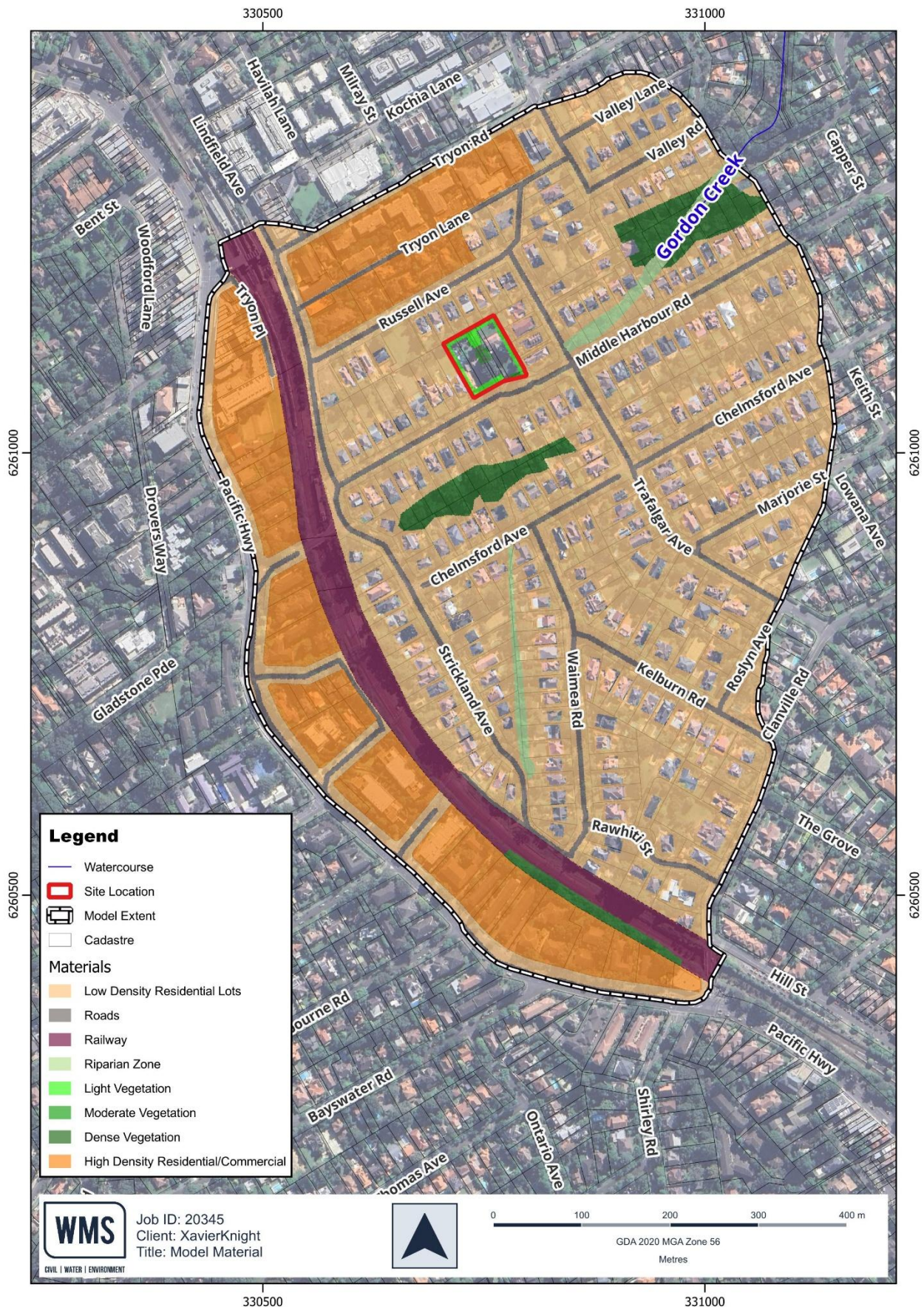


Figure 3-4 TUFLOW Model Roughness Distribution – Post-Development

3.3.6 Drainage Network

The location and size of the existing pits and pipes were extracted from the DBYA responses provided by Ku-ring-gai Council. Following the Council's DCP design standards, a 50% blockage of all pits has been modelled.

The following assumptions were made when determining pits and pipes properties:

- Pipe inverts were determined based on pipe diameter, assuming 500 mm cover from the surface. These were adjusted where necessary to ensure positive and realistic pipe grades.
- Pipe lengths were calculated based on geometrical length of line attributes.
- Pit sizes - for grated side entry pits assumed pit size of 900 mm x 600 mm with a 1.2 m intel, and for grated pits assumed pit size of 900 mm x 600 mm.
- Headwalls were represented as either a 2d boundary conditions (2d_bc) using a SX/CN connector lines or SX/CN points.

Before running the model, the 1D Integrity Tool (part of the TUFLOW plugin) was used to identify and correct potential errors in the 1D network. Manual adjustments were made where necessary to ensure no negative grades were assigned to the pipes. Google Street View was also utilised, where available, to verify pit locations and types.

In the post-development scenario, the existing diagonal pits and pipes within the site will be demolished. A 180 m³ flood storage tank is proposed to temporarily store floodwaters from the upstream existing drainage network. A new 1200 mm diameter pipe, along with 1500 mm x 1500 mm grated pits, is proposed to divert overland runoff along the western site boundary, directing it eastward to reconnect with the existing Council drainage system. The details of the internal drainage system can be found in Xavier Knight Civil design.

The drainage networks are illustrated in **Figure 3-5** and **Figure 3-6** for pre- and post-development, respectively.



Figure 3-5 TUFLOW Model Drainage Network – Pre-Development



Figure 3-6 TUFLOW Model Drainage Network – Post-Development

3.3.7 Critical Storm Selection

The 10%, 5%, 1%, 0.5%, 0.2% AEP and PMF events were simulated in TUFLOW for all durations between 10 min to 90 min and associated temporal patterns (TP) in accordance with ARR 2019. The water level results were then processed to extract the median values for the temporal patterns and the maximum values for the durations. The following durations produced the highest median levels at the site were therefore selected as critical (see **Table 3-4**).

Table 3-4 Critical Storms

Critical Storms					
10% AEP	5% AEP	1% AEP	0.5% AEP	0.2% AEP	PMF
20 min TP8	20 min TP8	25 min TP3	25 min TP3	25 min TP3	15 min TP8

4 FLOOD RISK ASSESSMENT

4.1 PRE-DEVELOPMENT FLOOD BEHAVIOUR

The modelling results for the pre-development scenario are provided in **Appendix A**. Results provided include flood depths and level contours, velocities, depth * velocity products and hazard (H1 to H6).

The key features of the flood behaviour are as follows:

- In 1% AEP event:
 - Consistent with the findings of the 2023 Flood Study, an overland flow path forms at the northwestern corner of the site, draining in a southeasterly direction. This flow path traps at the low point in the subject site to the east and merges with runoff from the southern direction of Middle Harbour Road, overtopping the intersection of Middle Harbour Road and Trafalgar Avenue and ultimately draining into Gordon Creek.
 - As shown in **Figure 4-1**, flood depths within the site vary from approximately 0.35 m at the northwest corner (start of the overland flow path) to approximately 0.18 m at the southeast corner (where runoff leaves the site). Flood depths within Middle Harbour Road at the front of the site are only up to 0.30 m.
 - Flood levels within the site vary from approximately 84.1 mAHD at the northwestern corner to approximately 80.6 mAHD at the southeastern corner.
 - Flood velocities within the site are in the order of 0.5 m/s – 1.0 m/s, with some localised areas reaching 2.0 m/s due to steep slopes.
 - Flood depth * velocity products within the site are generally lower than 0.5 m²/s.
 - Flood hazard (see **Figure 4-2**) falls within the H1 (No Restrictions) and H2 (Unsafe for Small Vehicles) categories, with some areas less than 5 m² reaching H5 (Unsafe for People & Vehicles – Buildings Require Special Engineering Design and Construction) category due to localised high velocities.
- In 5% AEP event:
 - Flood depths within the site vary from approximately 0.30 m at the start of the overland flow path to approximately 0.16 m where runoff leaves the site. Flood depths within Middle Harbour Road at the front of the site are only up to 0.18 m.
 - Flood levels within the site vary from approximately 84.0 mAHD at the northwestern corner to approximately 80.5 mAHD at the southeastern corner.
 - Flood velocities within the site are in the order of 0.3 m/s – 0.8 m/s, with some localised areas reaching 2.0 m/s due to steep slopes.
 - Flood depth * velocity products within the site are generally lower than 0.4 m²/s.
 - Flood hazard is H1 (No Restrictions) across flow paths due to the small flood depths, with some localised areas reaching H2 (Unsafe for Small Vehicles).
- In PMF event:
 - The overland flow path across the site is expected to become wider and deeper during the PMF event. Flood depths within the site range from 0.5 m to 0.8 m, with floodwaters on Middle Harbour Road reaching close to 1.0 m at the front of the site.
 - Flood levels within the site vary from approximately 84.5 mAHD at the northwestern corner to approximately 81.3 mAHD at the southeastern corner.
 - Flood velocities within the site are in the order of 1.0 m/s – 1.5 m/s, with some localised areas reaching 2.4 m/s due to steep slopes.
 - Flood depth * velocity products within the site reach 1.2 m²/s.
 - Flood hazard falls within the H4 (Unsafe for People & Vehicles) and H5 (Unsafe for People & Vehicles – Buildings Require Special Engineering Design and Construction) categories.

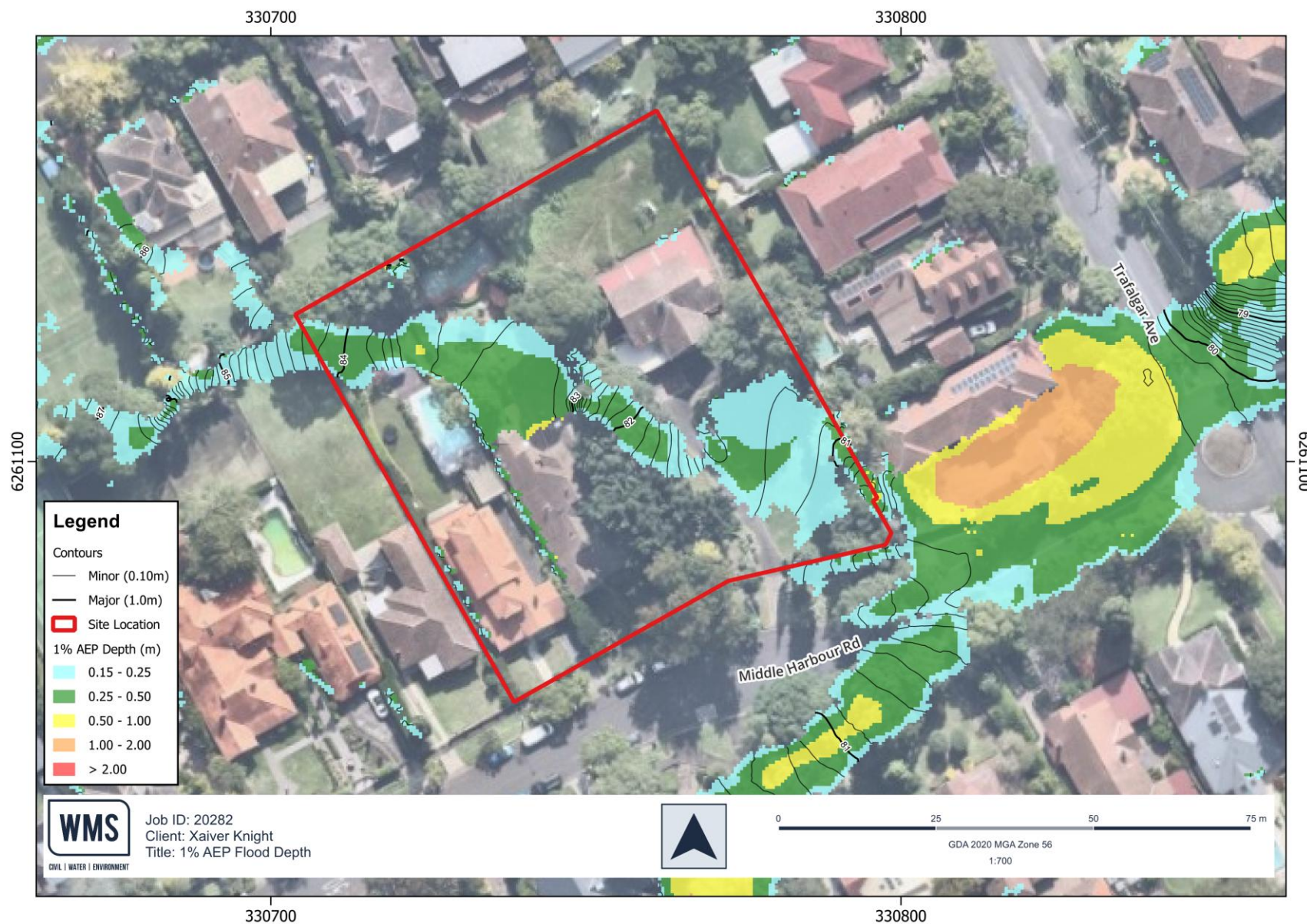


Figure 4-1 1% AEP Flood Peak Depth – Pre-Development

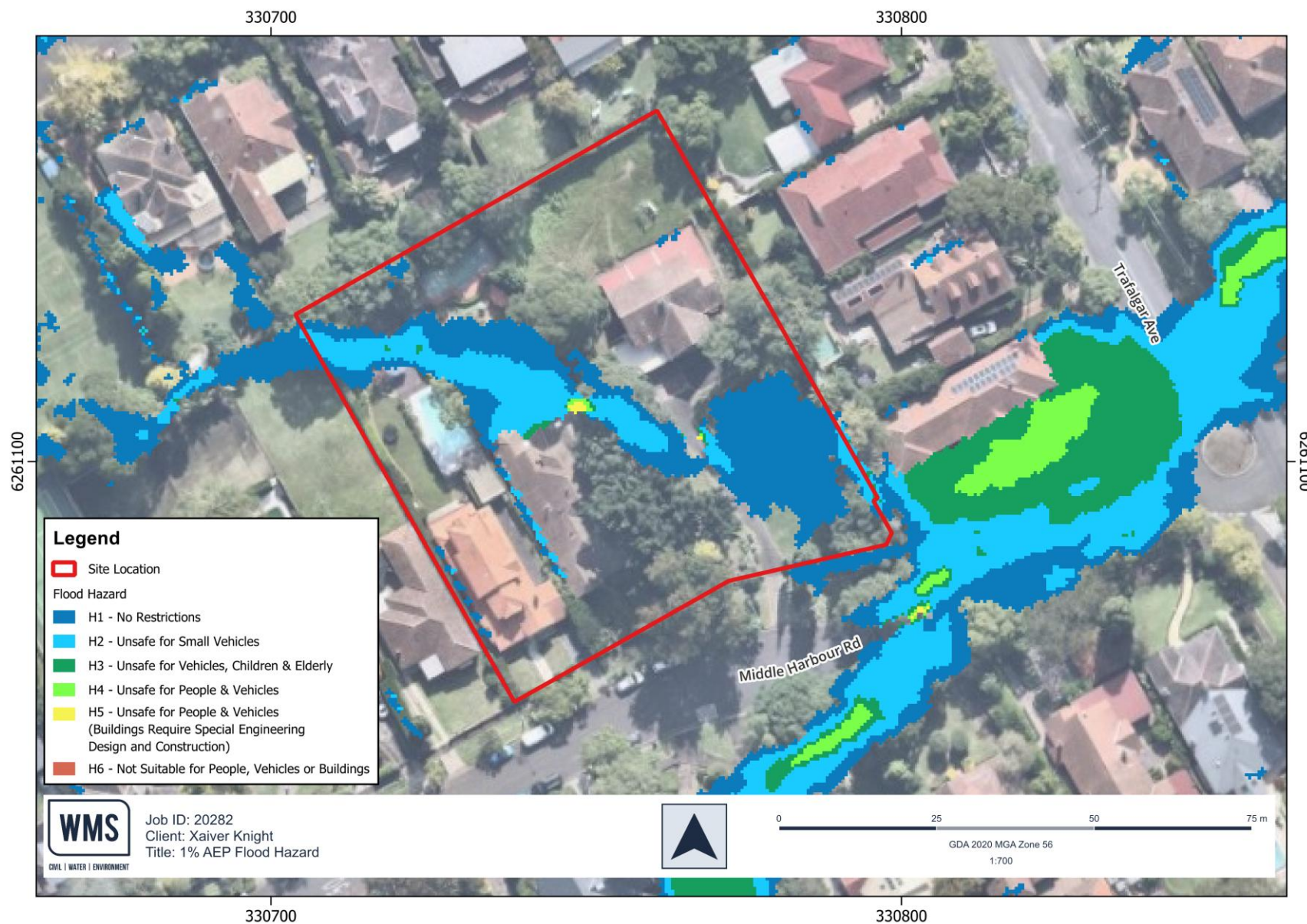


Figure 4-2 1% AEP Flood Peak Hazard – Pre-Development

4.2 POST-DEVELOPMENT FLOOD BEHAVIOUR

The modelling results for the post-development scenario are provided in **Appendix B**. Results provided include flood depths and level contours, velocities, depth * velocity products, hazard (H1 to H6), flood level afflux and hazard afflux.

The key features of the flood behaviour are as follows:

- In 1% AEP event:
 - The proposed swales, drainage network and flood storage tank are designed to collect and divert the existing overland flow path along the western boundary and discharge it into the existing council drainage system. Wet areas within the site are primarily located along the western boundary as shown in **Figure 4-3**, with flood depths generally in the range of 0.2 - 0.3 m.
 - Flood levels within the site range from approximately 84.4 mAHD to 80.5 mAHD. The maximum flood level at the dwelling entry is 83.1 mAHD.
 - In the proposed swales, flood depth * velocity products within the site are generally below 0.4 m²/s, with some localised areas near the overland flow entry point experiencing slightly higher depth * velocity products, up to 0.55 m²/s
 - In the proposed swales in **Figure 4-4**, flood hazard falls within the H1 (No Restrictions) and H2 (Unsafe for Small Vehicles) categories, with some areas where velocities are higher reaching H3 (Unsafe for Vehicles, Children & Elderly) category.
 - As shown in **Figure 4-5**, the proposed development results in limited flood level afflux within neighbouring properties and Middle Harbour Road. The proposed diversion can slightly reduce water levels along the existing flow path, and some isolated areas become flood-free.
 - An afflux of up to 0.10 m is observed to the northwest of the site. These areas are open space and part of the existing overland flow path, which already experiences flood depths greater than 0.3 m. Limited inundation occurs along Middle Harbour Road, which is caused by surcharging of the existing inlet pit on Middle Harbour Road. A revised drainage design will be undertaken during the detailed design phase of the development to alleviate these impacts.
- In 5% AEP event:
 - The existing overland flow runoff will be mostly conveyed through the flood storage tank and underground pipes. Wet areas within the site are limited to the northwestern corner, with flood depths generally in the range of 0.2 – 0.3 m and flood levels up to 84.2 mAHD.
 - The proposed development does not result in changes to flood level and flood hazard classification offsite.
- In PMF event:
 - The designed drainage system reaches its capacity during the PMF event. Overland runoff flows westward before turning east, passing across the site frontage and reconnecting with the main overland flow path along Middle Harbour Road.
 - Overall, flood depths, velocities, depth * velocity products and hazard remain within the same ranges of those observed in the pre-development scenario.
 - The maximum duration of inundation where hazard is at or above H3 across storm durations ranging from 10min to 360 min is shown in **Figure 4-6**. These results show that, across most of the site, hazard at or higher than H3 is not expected to last longer than 3 hours, with some localised areas within the swale lasting up to 6 hours.
- Based on the results described above, most of the runoff from upstream of the site is expected to be managed appropriately through the proposed drainage system. As such, the post-development overland flow flood risk at the site is considered very limited in all modelled events, excluding the PMF. The proposed drainage system is not designed to cater for PMF event. Furthermore, the flood level and hazard afflux results indicate that flood behaviour off-site would remain largely unchanged from pre-development conditions.

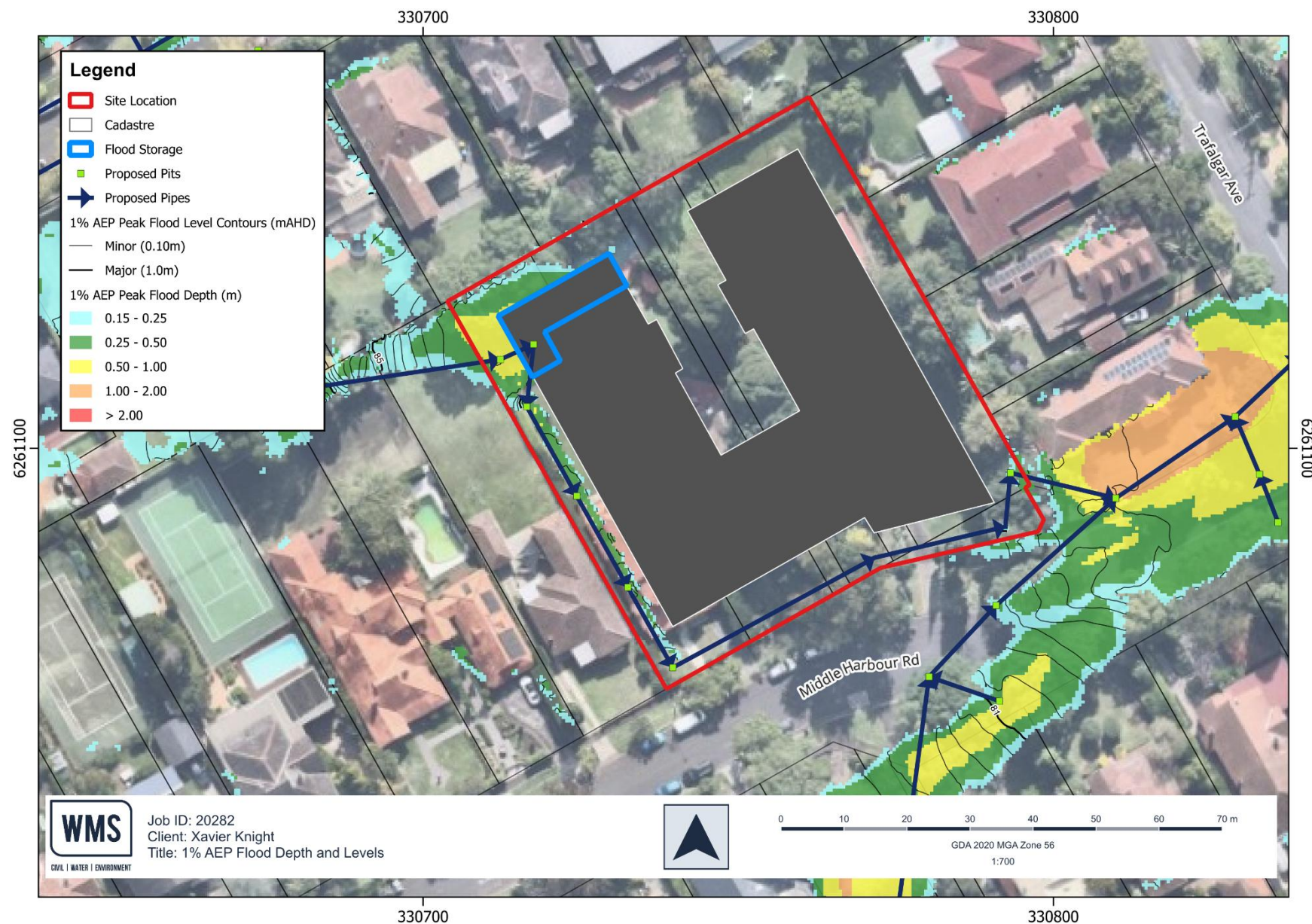


Figure 4-3 1% AEP Flood Peak Depth – Post-Development

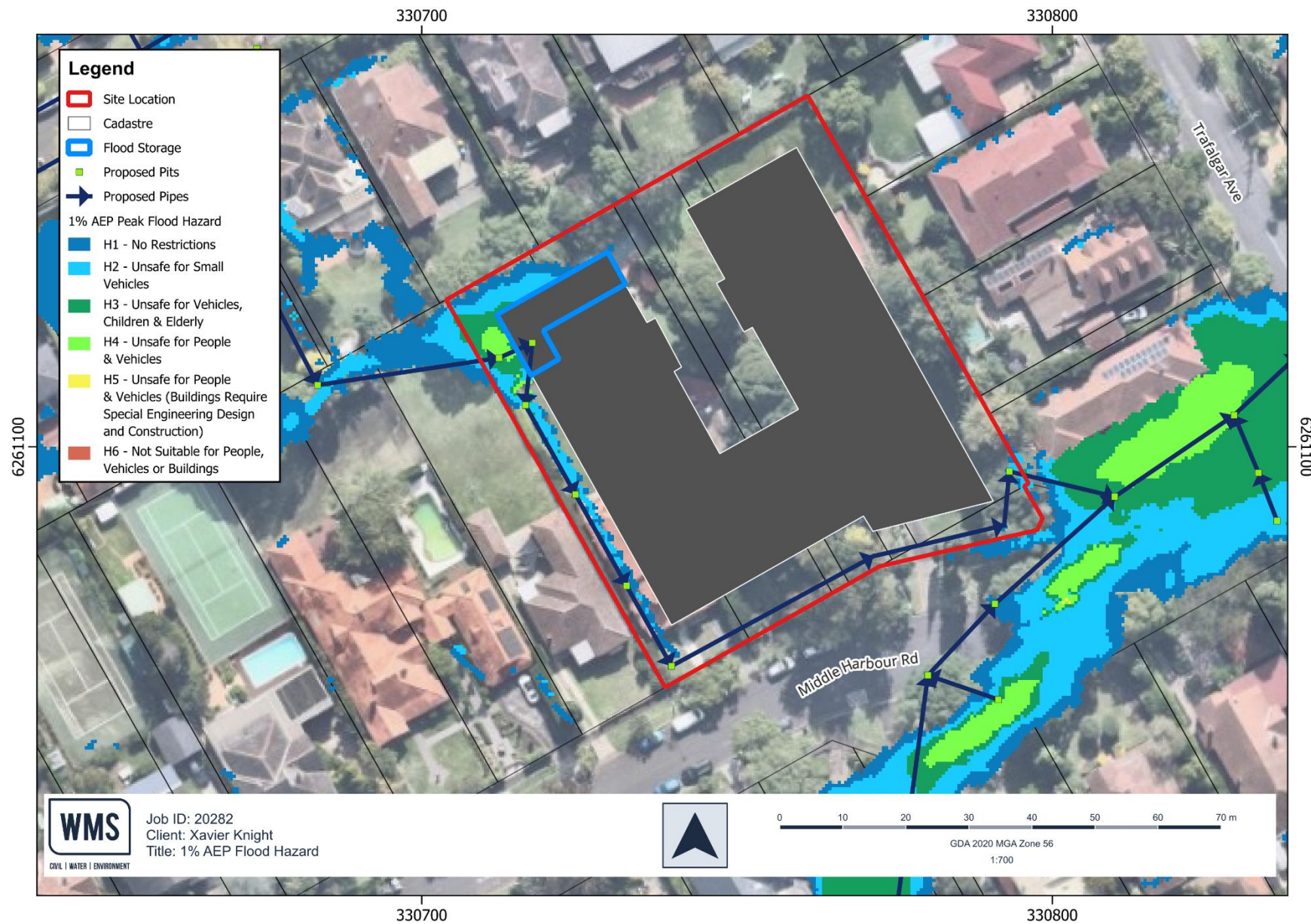


Figure 4-4 1% AEP Flood Peak Hazard – Post-Development

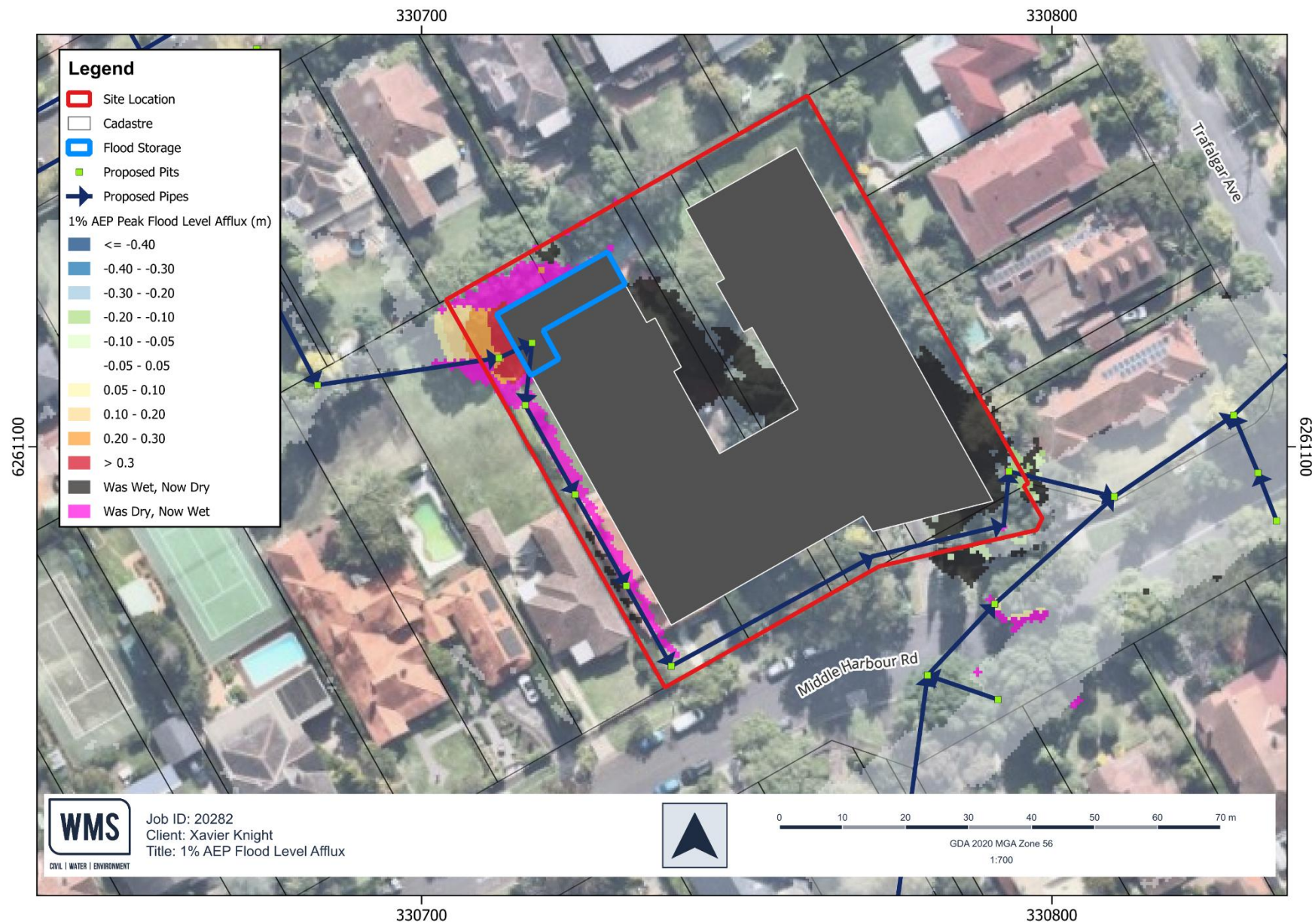


Figure 4-5 1% AEP Flood Level Afflux

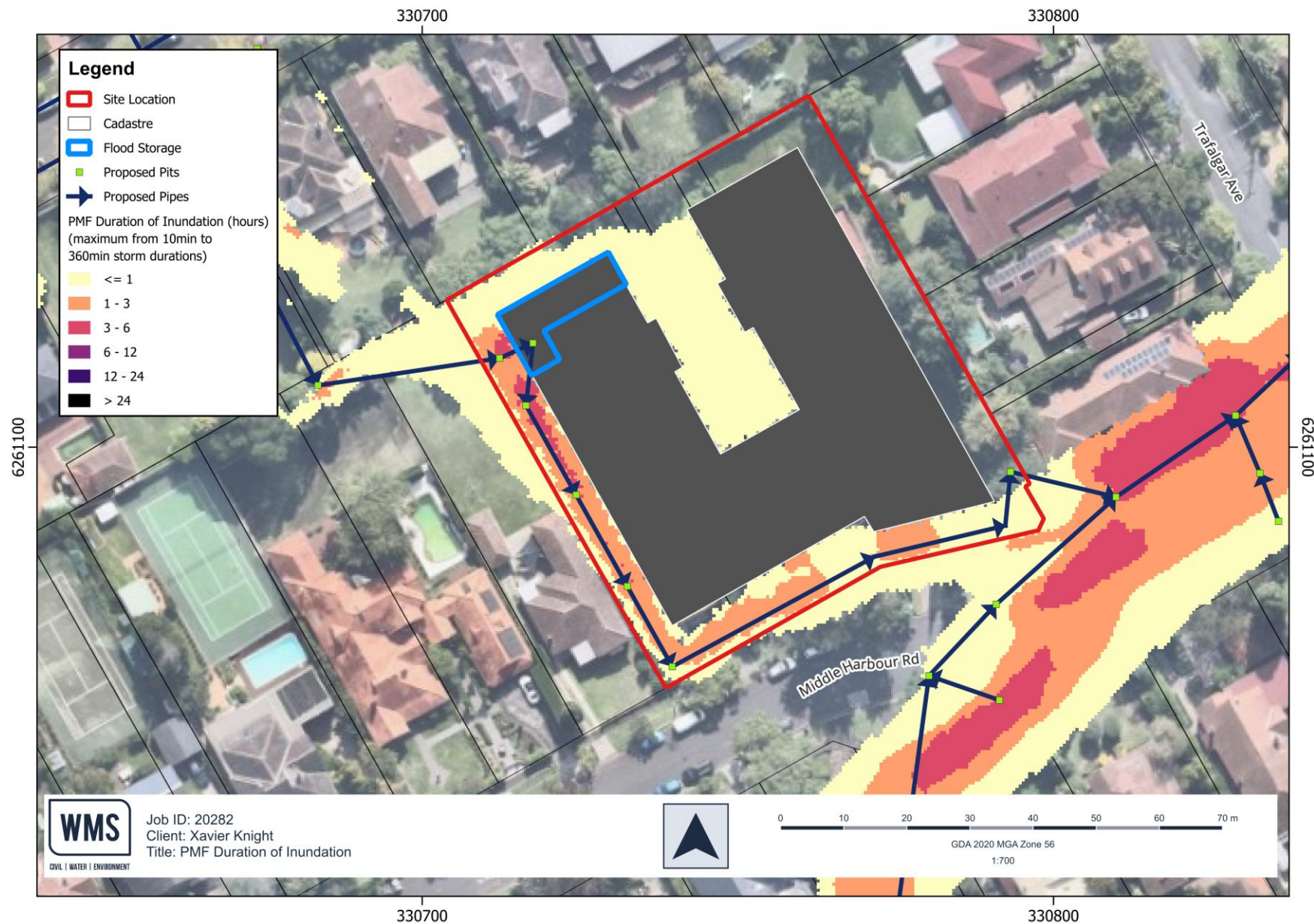


Figure 4-6 PMF Duration of Inundation

4.3 CLIMATE CHANGE SENSITIVITY

To assess the sensitivity of the design results to an increase in rainfall intensity, the 0.5% AEP and 0.2% AEP events are compared to the 1% AEP event as a proxy for two potential climate change scenarios under post-development scenario. The results of the comparison are provided in **Appendix C**.

Within the site, the climate change impact assessment indicates that flood behaviour in the 0.5% AEP and 0.2% AEP events is generally consistent with the results shown in the 1% AEP event. Flood level increases of up to 0.3 m are expected across most of the site, except within localised areas within the swales where increases of up to 0.45 m are observed in the 0.2% AEP event. This outcome is expected, as overland flow flood behaviour typically does not display significant 'scale' between events – i.e. results in rarer events look similar to more frequent events as runoff is generally free draining and shallow across a range of events.

These results provide confidence that the proposed development will not be subject to significantly increased flood risk under climate change conditions.

5 FLOOD EMERGENCY MANAGEMENT

Flood Emergency Response Plans (FERPs) for both the construction and operational phase of the development will be prepared for the site prior to construction certificate. The FERPs will include the following features:

- Access to flood warning information and protocols to activate the FERP;
- Recommended evacuation strategy (i.e., horizontal vs vertical evacuation);
- Trigger warnings for actions;
- Details of the person(s) responsible for implementing and maintaining the plan;
- Plans for safe evacuation, before the site or its accessway are flooded;
- Evacuation procedures, routes and assembly points;
- Flood actions with clear responsibilities;
- Maintenance of the FERP; and
- What to do before, during and after a flood, to be aligned with NSW SES Requirements and Local Flood Plan.

It is envisaged that the recommended evacuation strategy for the site will be **horizontal evacuation**, as the site is exposed to high hazard flooding during the PMF event and therefore is not considered eligible for 'shelter-in-place' in accordance with the NSW Government Shelter in Place guideline for flash flooding.

To support horizontal evacuation, an elevated walkway has been provided in the design which connects the building's main entrance to the flood-free area in the southwest corner of the site. From this point, evacuation to higher ground is available to the west along Middle Harbour Road. The walkway has been designed to be above the PMF level to ensure a flood-free evacuation route.

However, if shelter in place is required, the proposed buildings will have multiple storeys therefore providing adequate space for occupants to shelter-in-place above PMF levels.

In addition, as recommended by the NSW SES in their feedback provided on the 7th July 2025, the FERP for the site will incorporate a flood warning strategy that relies on clear, actionable triggers rather than the AEP of an event. The FERP will utilise Bureau of Meteorology Severe Weather Warnings and Thunderstorm Warnings as the primary sources of advice regarding the potential for flood-producing rainfall. These warnings will form the basis for early awareness, staged preparedness actions, and timely implementation of evacuation procedures as required. The plan will ensure that warnings are communicated clearly and consistently to all site users to support safe and effective flood response.

6 FLOOD PLANNING REQUIREMENTS

The proposed development is subject to development controls set out in Section 24D.2 of the Ku-ring-gai Development Control Plan 2024, 24D – Water Management – Flood Studies and the Design Flood Standard. The Planning and Design Criteria are set out in Section 24D.2 and have been outlined below in **Table 6-1** to assess the proposed development's compliance with each requirement.

Table 6-1 *Flood Planning Requirements*

Planning Requirements	Comment	Compliant (tick/cross)
1. Where a Catchment Flood Study has been completed and the site is identified on the Flood Planning Area map any development proposal is to demonstrate:	The site is located within the Middle Harbour Southern Catchment. According to the Middle Harbour Southern Catchments Flood Study (BMT, 2023), herein referred to as 2023 Flood Study, there is an overland flow path travelling diagonally from the west to the southeastern corner of the site. Therefore, a local, site-specific flood model was developed by WMS to inform the overland flow assessment at the site. The model was developed in accordance with ARR 2019 guidelines, and consisted of a TUFLOW hydraulic model utilising a rain on grid approach whereby rainfall was applied directly to the model terrain.	✓
i) Development is confined to a part of the site which is flood free; or	NA	NA
ii) All dwellings are set at or above the specified freeboard; and	In their RFI dated 2 nd July 2025, CPHR noted that an at-site rainfall analysis was used for Ku-ring-gai Council's Middle Harbour Southern Catchments Flood Study (BMT, November 2024) and recommended that the IFD rainfall depths used in the 2024 study be adopted for this FIRA. Comparison between the 1% AEP rainfall data from the 2024 study and the 0.2% AEP rainfall data used in this FIRA shows a difference of rainfall (mm) of approximately 2%. As such, the 0.2% AEP has been used as a proxy for the 1% AEP event with rainfall data from the 2024 BMT study for the purposes of setting out flood planning levels. Finished floor levels (84.1 mAHD) in the proposed development are 0.7 m higher than the 0.2% AEP flood level at the main entrance (83.4 mAHD). Additional points of entry such as balconies are protected up to the applicable 0.2% AEP level by solid walls. The driveway entrance crest is set to 81.1 mAHD, which is the applicable 0.2% AEP flood level at the entrance location.	✓
iii) Development will not exacerbate flooding depth, extent or flow velocities on adjoining properties; and	As per the discussion in Section 4.2, the proposed development has been designed to ensure no detrimental increases in potential flood affections on adjoining properties. Some localised impacts can be addressed through the detailed drainage design in the next stage.	✓
iv) Any part of the dwelling house or any ancillary development that is erected at or below the flood planning level is to be constructed of flood compatible material, and able to withstand the forces exerted during a flood by water, debris and buoyancy up to the flood planning level.	The proposed development will be designed and constructed using flood-compatible material and ensuring all structures located at or below the flood planning level are capable of withstanding flood forces.	✓

As such, the proposed development is considered to achieve the objectives of the Ku-ring-gai Development Control Plan 2024.

7 CONCLUSIONS AND RECOMMENDATIONS

WMS Engineering has been engaged by Xavier Knight to prepare a Flood Impact Risk Assessment to support the proposed development at the 24-28 Middle Harbour Road, Lindfield. The assessment included the development of a direct rainfall TUFLOW model to define the pre- and post-development overland flood behaviour in the 10%, 5%, 1%, 0.5%, 0.2% AEP and PMF events, determining if the proposed development adversely impacts the local flood conditions, and an assessment of flood emergency management and flood planning requirements.

The key conclusions and recommendations from the assessment are as follows:

- Overall Flood Risk
 - The existing flood behaviour is consistent with the finding of the 2023 Flood Study. An overland flow path forms at the northwestern corner of the site, draining in a southeasterly direction.
 - The post-development flood results indicate that the proposed drainage system has been designed to collect and divert the existing overland flow path along the western boundary and discharge it into the existing council drainage system in the rare storm events. As such, the site will be subject to limited risk from overland flow.
- Flood Level and Hazard Afflux
 - The results indicate that the proposed development results in limited flood level afflux within neighbouring properties and Middle Harbour Road in all modelled events up to and including the 0.2% AEP event. The proposed diversion also slightly reduces water levels along the existing flow path, and some isolated areas become flood-free.
 - Although some localised impacts are observed on Middle Harbour Road due to surcharging of the existing inlet pit, these can be addressed during the detailed design phase of the development.
- Emergency Management
 - A Flood Emergency Response Plan will be prepared for the site prior to construction certificate.
 - It is envisaged that the recommended evacuation strategy will be shelter-in-place due to the nature of the local flooding and site conditions.
 - Access to/from the site is available in all modelled events up to the 0.2% AEP event to the west via Middle Harbour Road. This access becomes cut off by hazard greater than H2 in the PMF event.
- Flood Planning Requirements
 - The proposed development has been assessed against Ku-ring-gai Council's planning requirements and has been found to comply with all requirements.
 - The 0.2% AEP event has been used as a proxy for the 1% AEP event with rainfall data from the Middle Harbour Southern Catchments Flood Study (BMT, November 2024) for the purposes of setting out flood planning levels. Finished floor levels (84.1 mAHD) in the proposed development are set to 700 mm above the 0.2% AEP flood level (83.4 mAHD) and additional entry points such as balconies and the driveway entrance are set to the applicable 0.2% AEP flood level.
 - Some localised impacts can be addressed through the detailed drainage design in the next stage.

This assessment provides information and advice based on the data provided. Any advice provided is based on the most accurate information currently available and may change if new information becomes available.

8 REFERENCES

- Ball J, B. M. (2019). *Australian Rainfall and Runoff: A Guide to Flood Estimation*. Commonwealth of Australia (Geoscience Australia).
- BMT. (2023). *Middle Harbour Southern Catchments Flood Study*.
- BOM. (2003). *The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method*.
- Jordan, P. (2005). Growth curves and temporal patterns of short duration design storms for extreme events. *Australian Journal of Water Resources*.
- NSW Government. (2023). *Flood risk management manual: the policy and manual for the management of flood liable land*.
- NSW Office of Environment & Heritage. (2019). *Review of ARR Design Inputs for NSW*.
- TUFLOW. (2018). *TUFLOW Manual 2018-03-AD*.

APPENDIX A

PRE-DEVELOPMENT FLOOD MAPPING



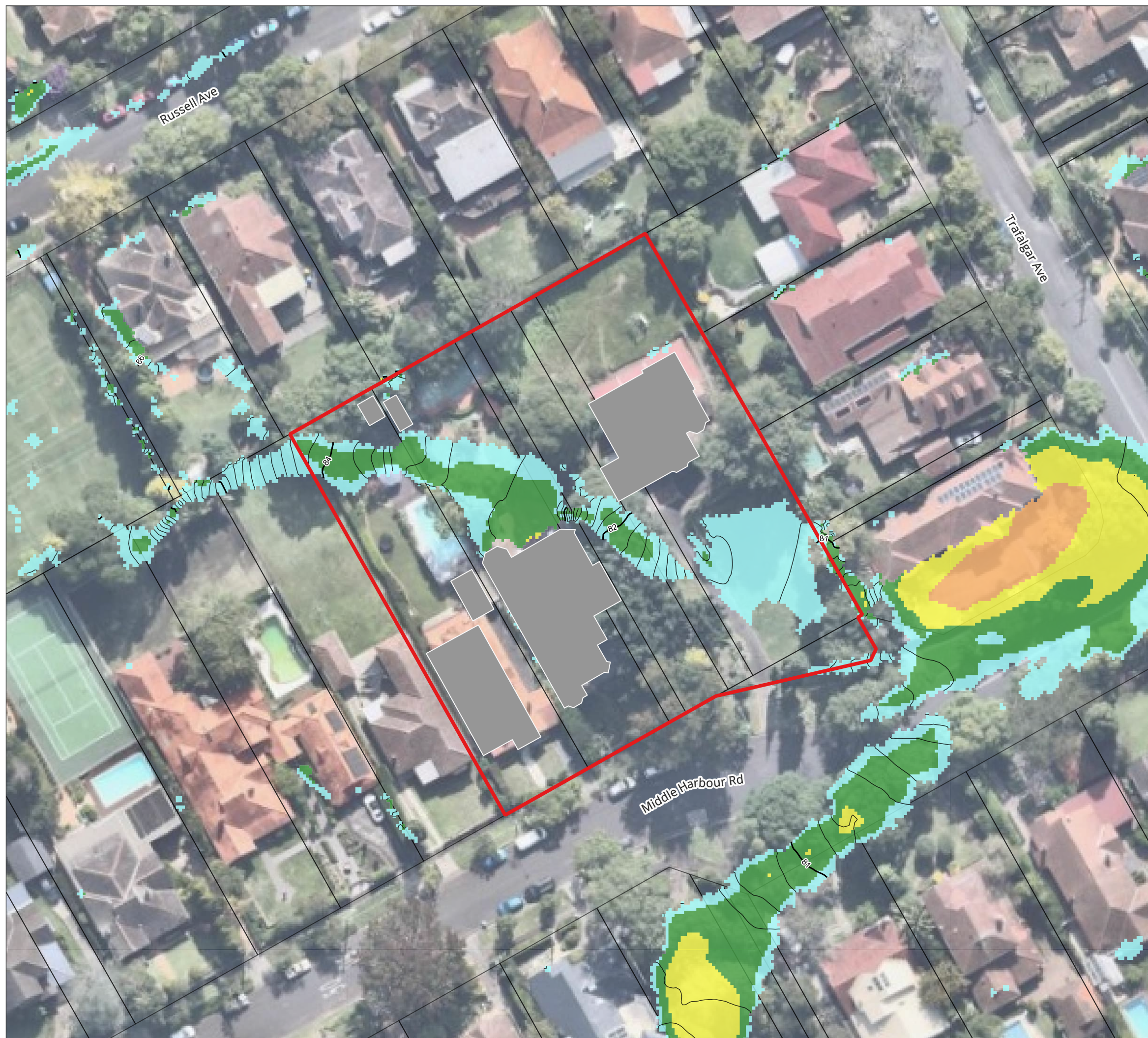
CIVIL | WATER | ENVIRONMENT

Appendix A-1

Pre-Development
Peak Flood Depth + Flood Level
Contours
10% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Water Level Contours (mAHD)
 - Minor (0.10m)
 - Major (1.0m)
- Flood Depth (m)
 - 0.15 - 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 2.00
 - > 2.00



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-2

Pre-Development
Peak Flood Velocity
10% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



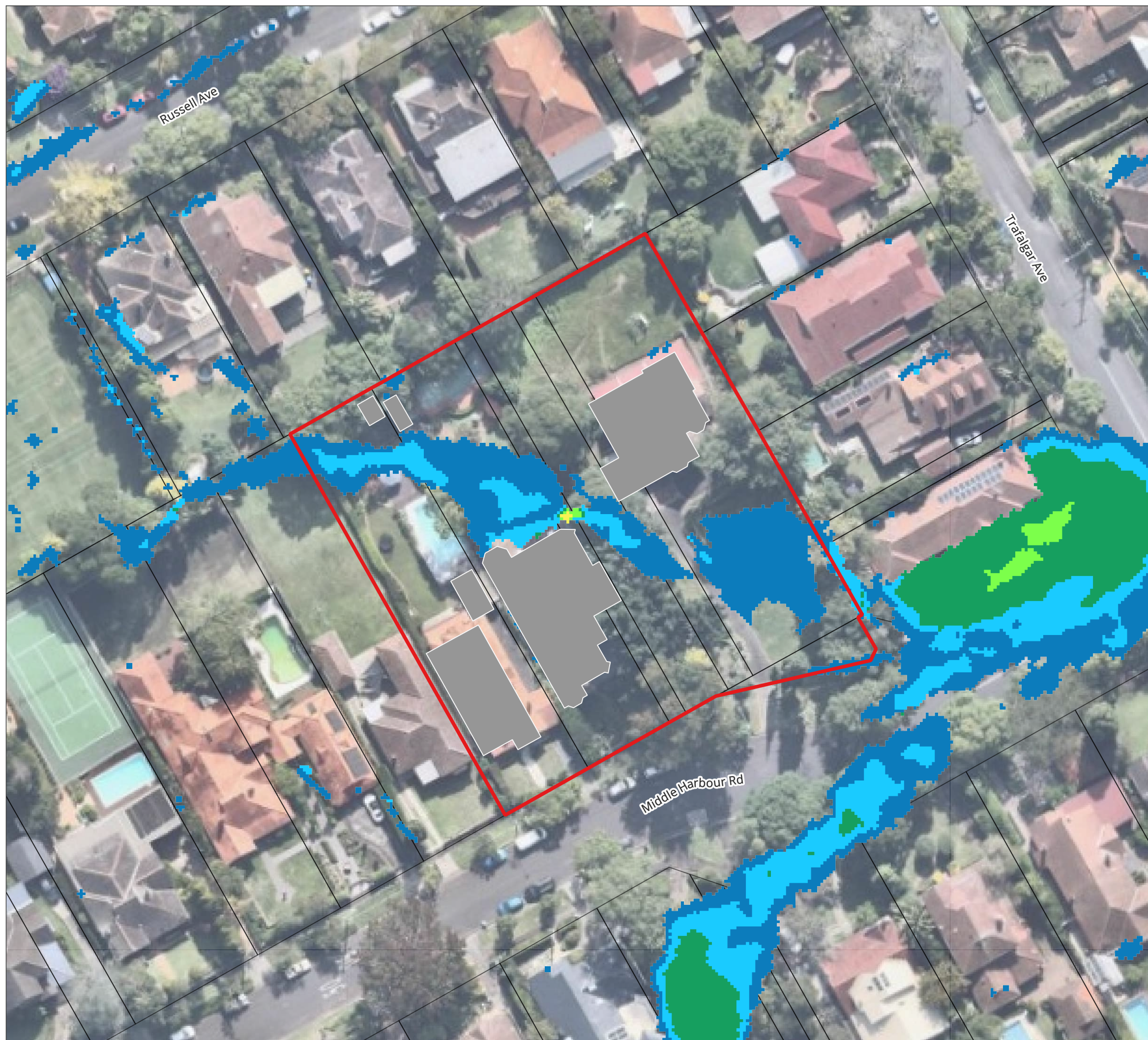
CIVIL | WATER | ENVIRONMENT

Appendix A-3

Pre-Development
Flood Hazard Classification
10% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Hazard Classification**
- H1 - No Restrictions
- H2 - Unsafe for Small Vehicles
- H3 - Unsafe for Vehicles, Children & Elderly
- H4 - Unsafe for People & Vehicles
- H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
- H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



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Appendix A-4

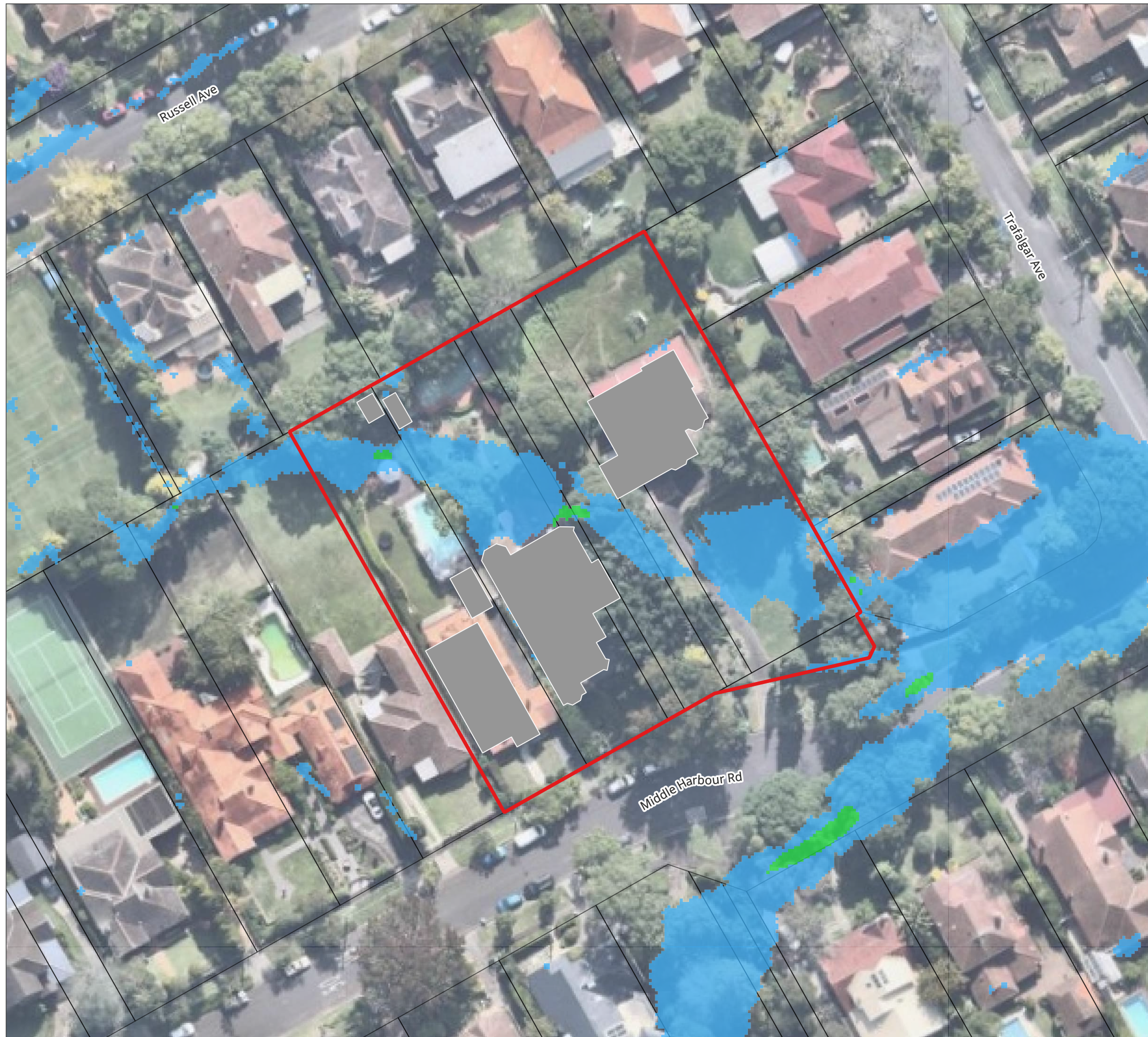
Pre-Development
Peak Flood Depth * Velocity
10% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre

Peak Flood Depth x Velocity

- ≤ 0.4
- $0.4 - 0.8$
- $0.8 - 1.2$
- > 1.2



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



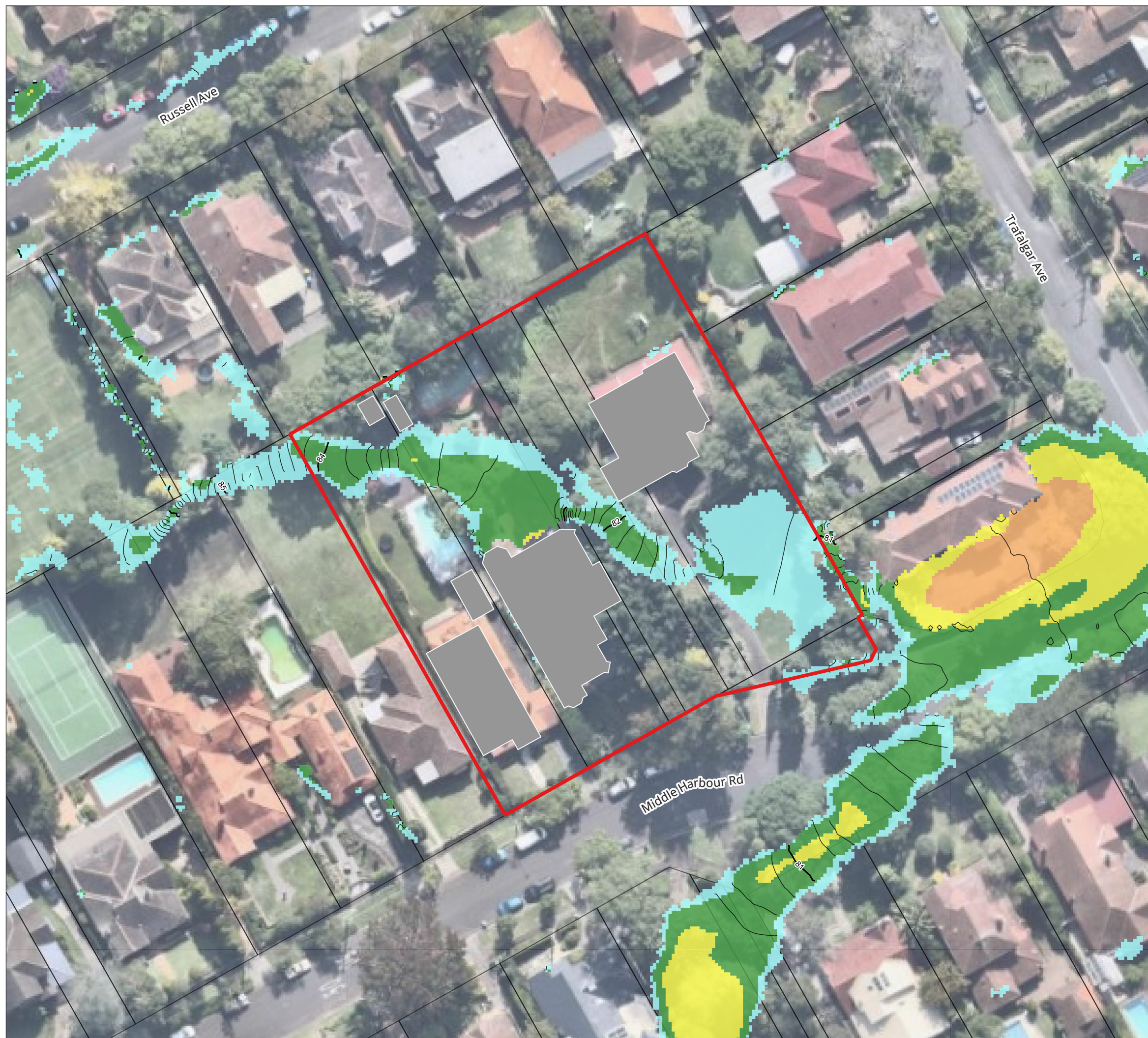
CIVIL | WATER | ENVIRONMENT

Appendix A-5

Pre-Development
Peak Flood Depth + Flood Level
Contours
5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Water Level Contours (mAHD)
 - Minor (0.10m)
 - Major (1.0m)
- Flood Depth (m)
 - 0.15 - 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 2.00
 - > 2.00



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-6

Pre-Development
Peak Flood Velocity
5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



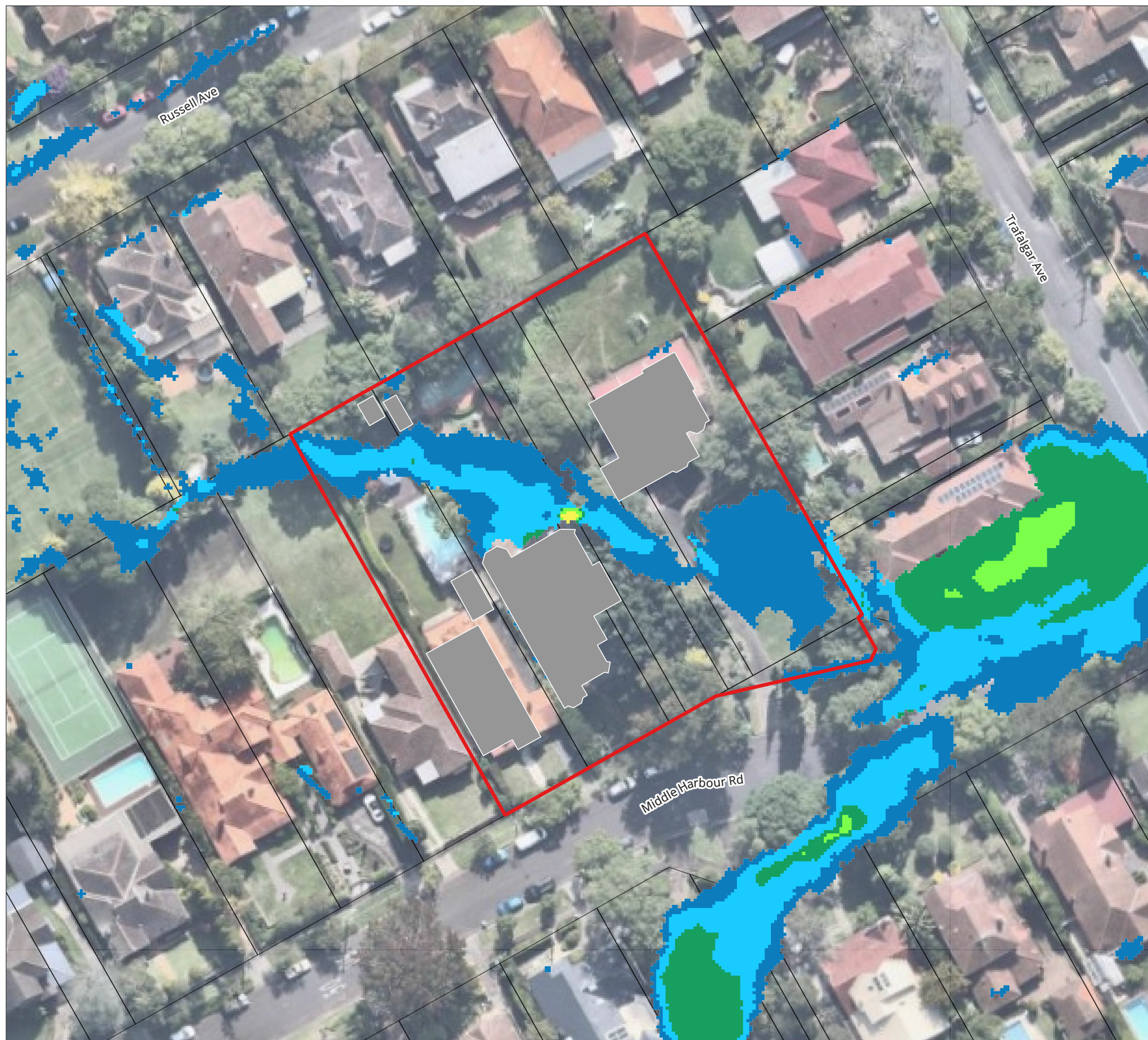
CIVIL | WATER | ENVIRONMENT

Appendix A-7

Pre-Development
Flood Hazard Classification
5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Hazard Classification**
- H1 - No Restrictions
- H2 - Unsafe for Small Vehicles
- H3 - Unsafe for Vehicles, Children & Elderly
- H4 - Unsafe for People & Vehicles
- H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
- H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



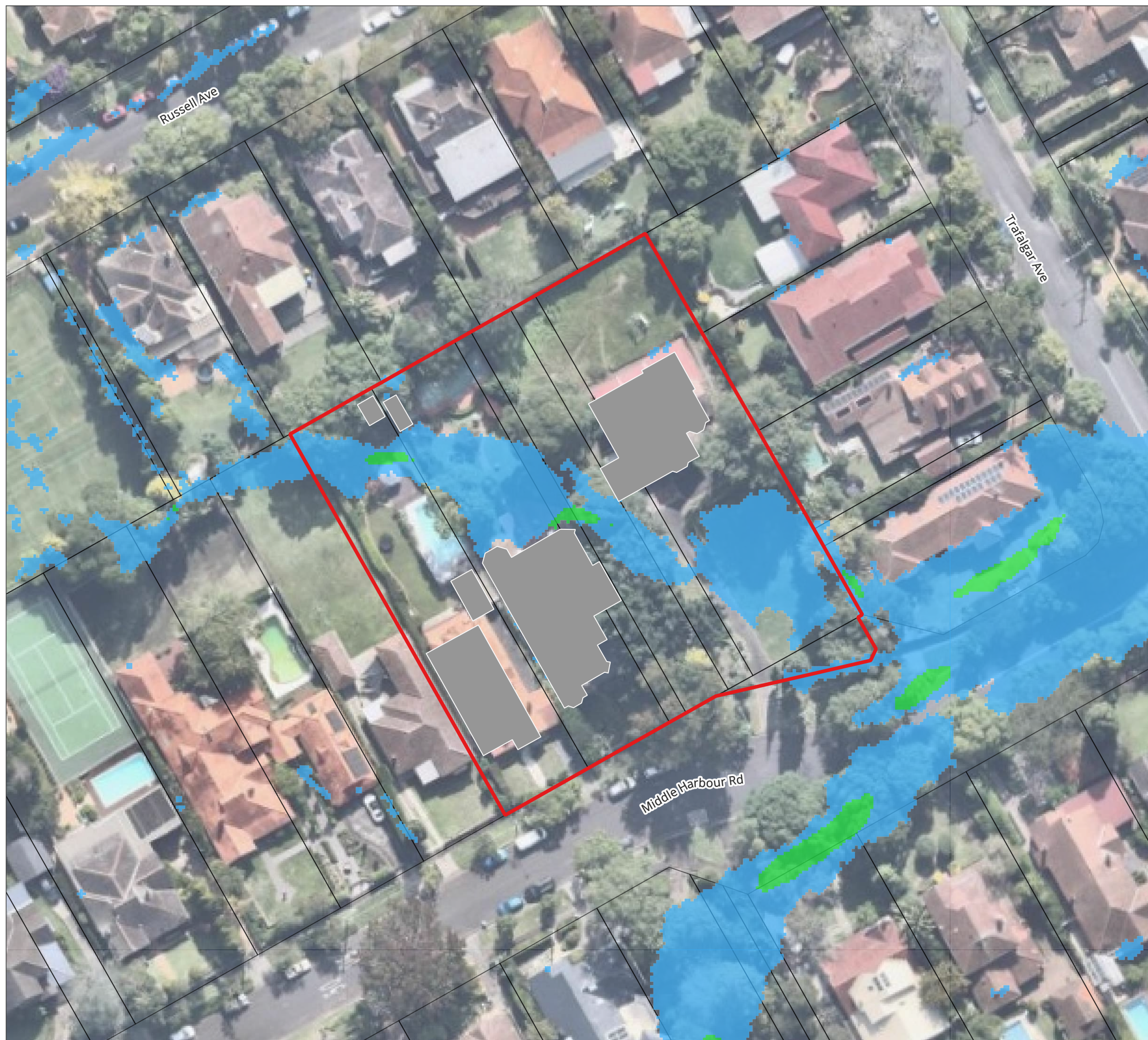
CIVIL | WATER | ENVIRONMENT

Appendix A-8

Pre-Development
Peak Flood Depth * Velocity
5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Flood Depth x Velocity
 - ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-9

Pre-Development
Peak Flood Depth + Flood Level
Contours
1% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-10

Pre-Development
Peak Flood Velocity
1% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025



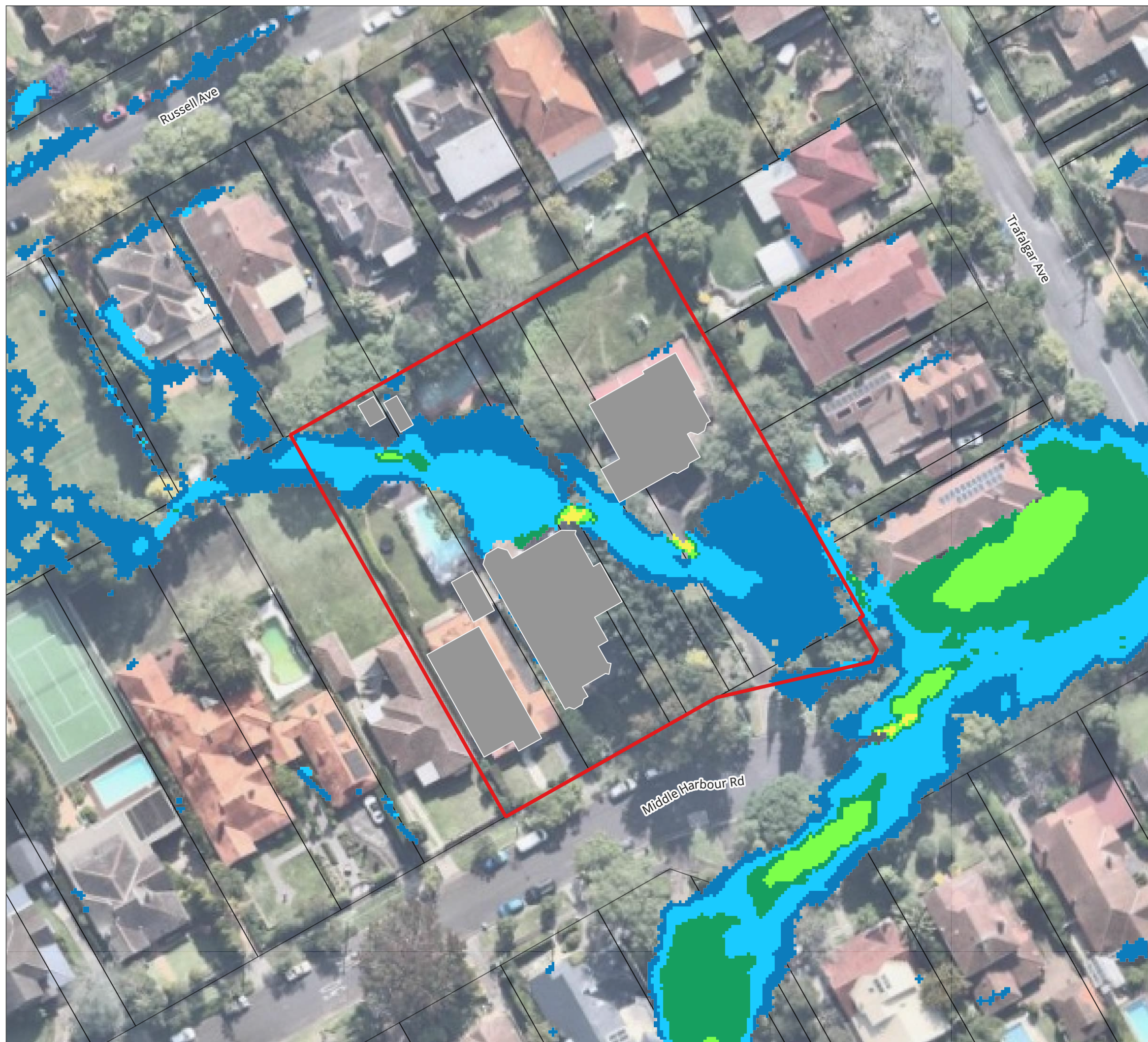
CIVIL | WATER | ENVIRONMENT

Appendix A-11

Pre-Development Flood Hazard Classification 1% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Hazard Classification**
- H1 - No Restrictions
- H2 - Unsafe for Small Vehicles
- H3 - Unsafe for Vehicles, Children & Elderly
- H4 - Unsafe for People & Vehicles
- H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
- H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA



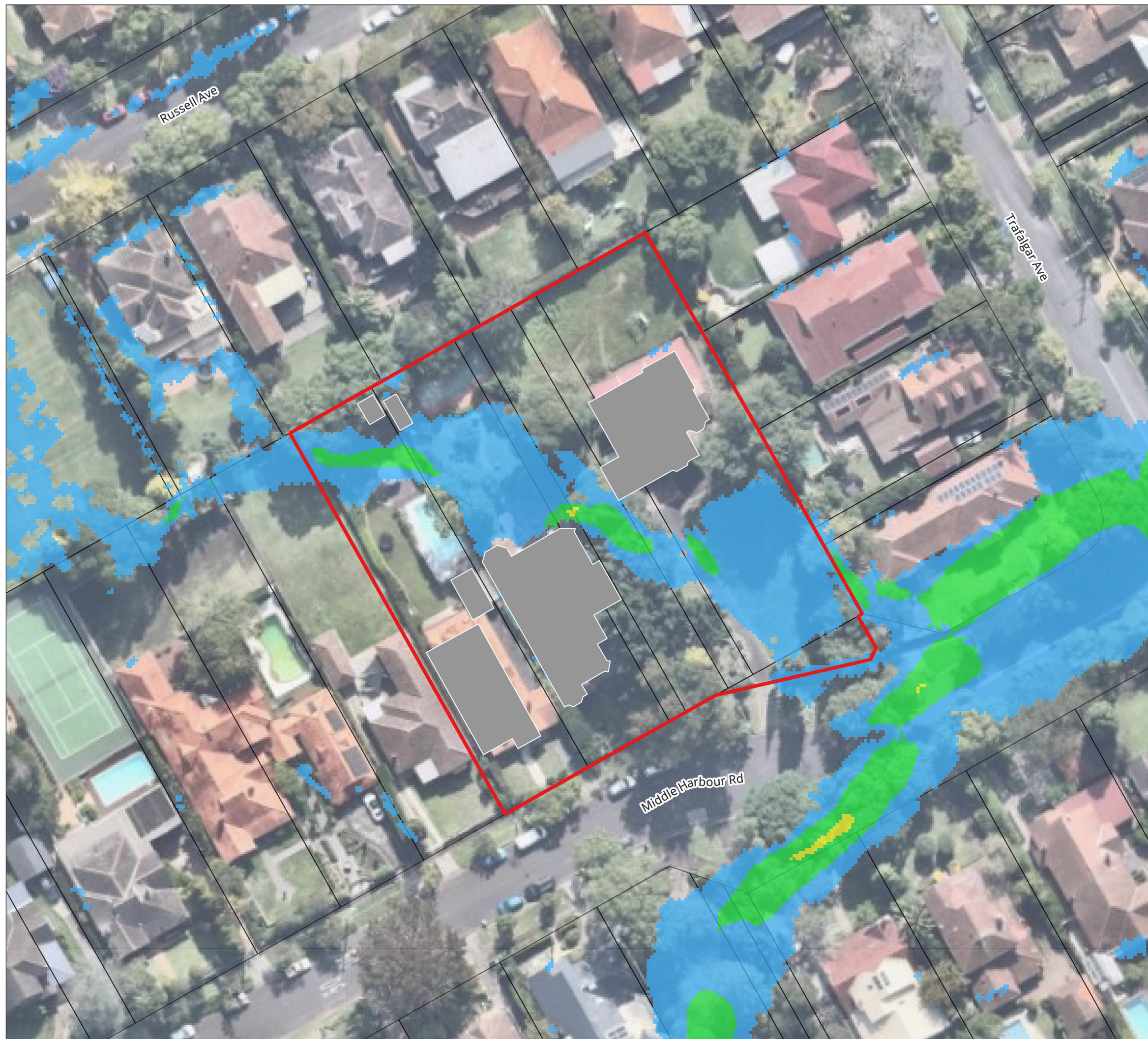
CIVIL | WATER | ENVIRONMENT

Appendix A-12

Pre-Development
Peak Flood Depth * Velocity
1% AEP

LEGEND

- Site Location
 - Existing Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-13

Pre-Development
Peak Flood Depth + Flood Level
Contours
0.5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-14

Pre-Development
Peak Flood Velocity
0.5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025



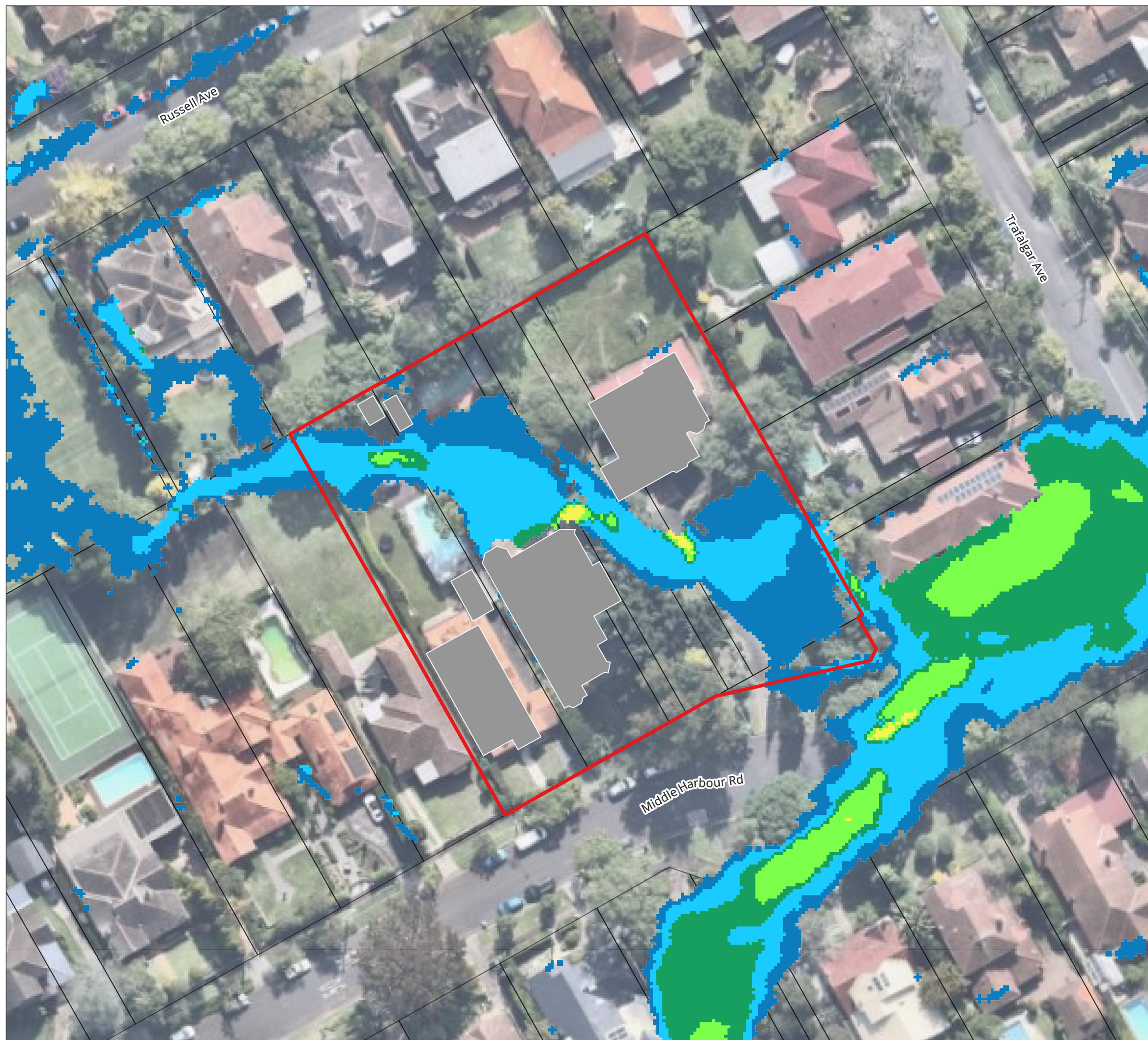
CIVIL | WATER | ENVIRONMENT

Appendix A-15

Pre-Development
Flood Hazard Classification
0.5% AEP

LEGEND

- Site Location
 - Existing Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



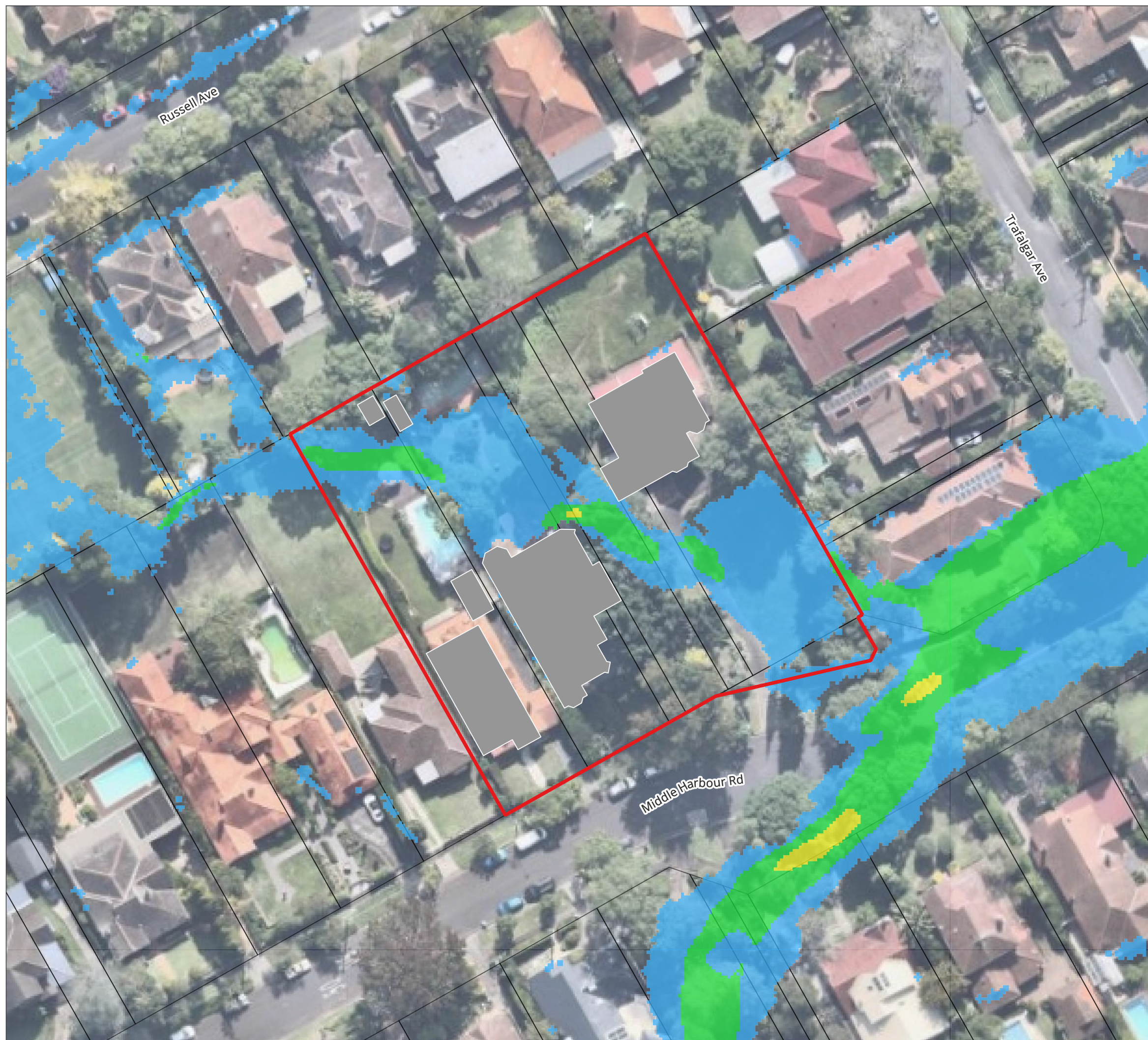
CIVIL | WATER | ENVIRONMENT

Appendix A-16

Pre-Development
Peak Flood Depth * Velocity
0.5% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Flood Depth x Velocity
 - ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-17

Pre-Development
Peak Flood Depth + Flood Level
Contours
0.2% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



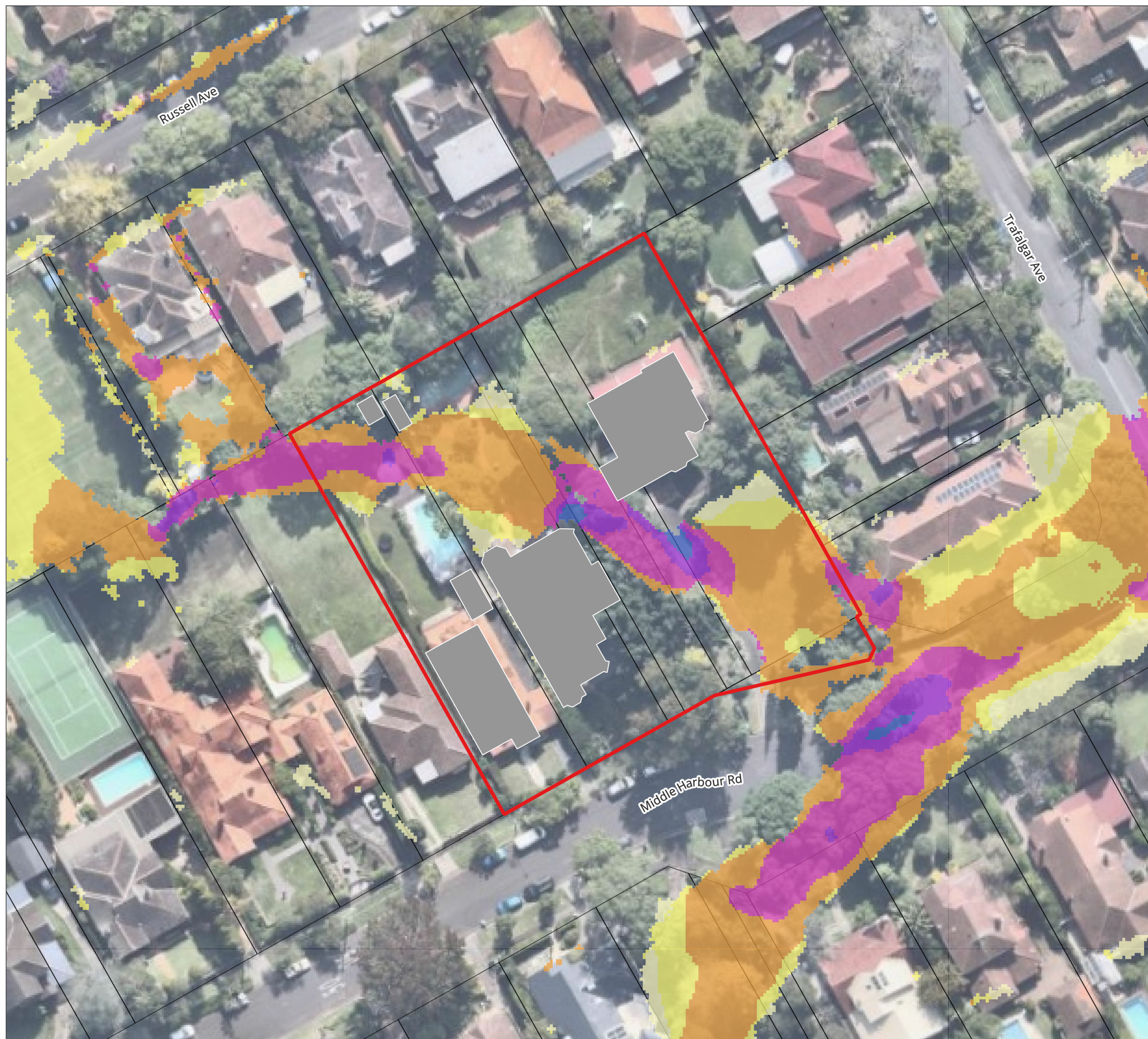
CIVIL | WATER | ENVIRONMENT

Appendix A-18

Pre-Development
Peak Flood Velocity
0.2% AEP

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



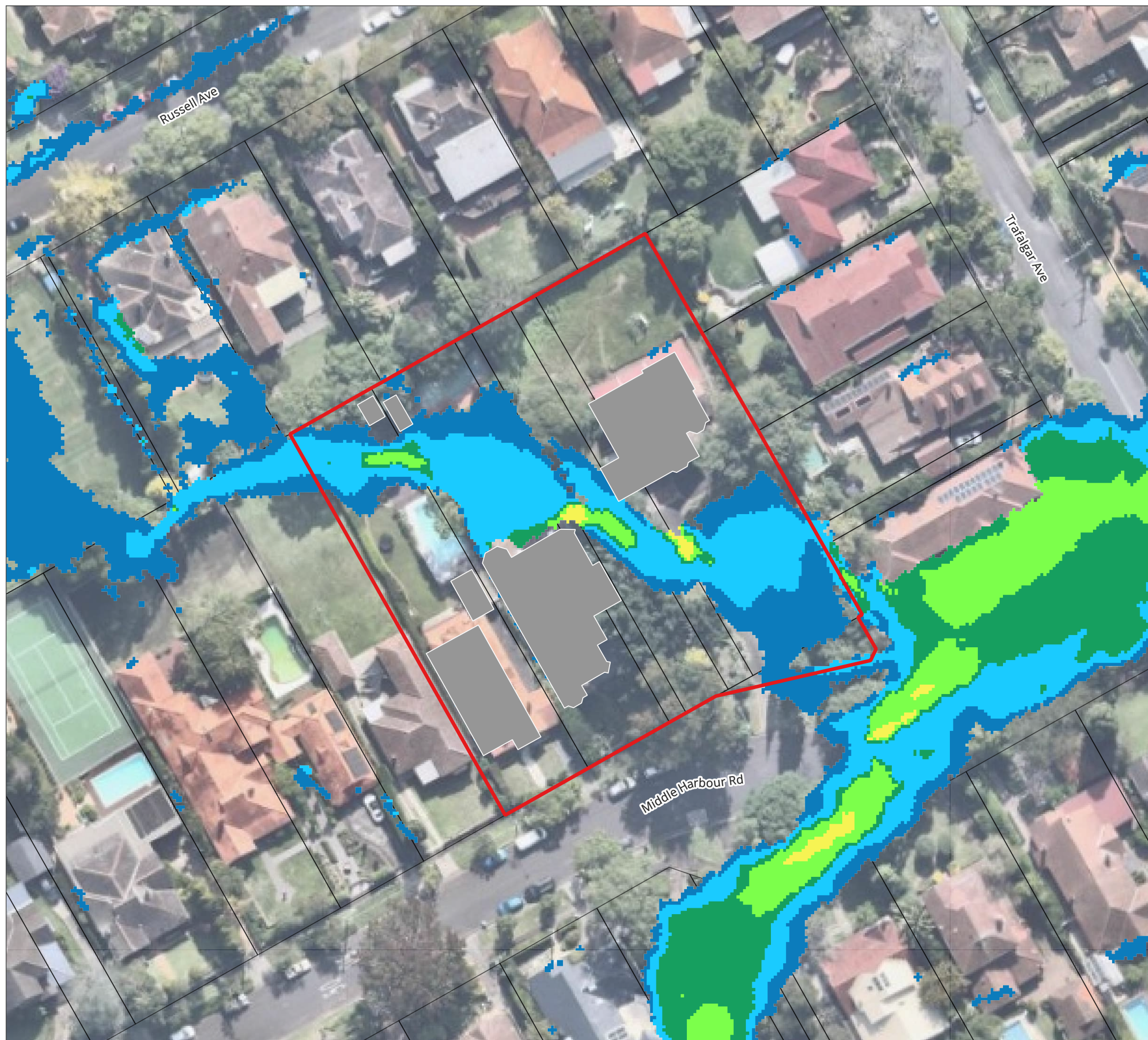
CIVIL | WATER | ENVIRONMENT

Appendix A-19

Pre-Development
Flood Hazard Classification
0.2% AEP

LEGEND

- Site Location
 - Existing Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



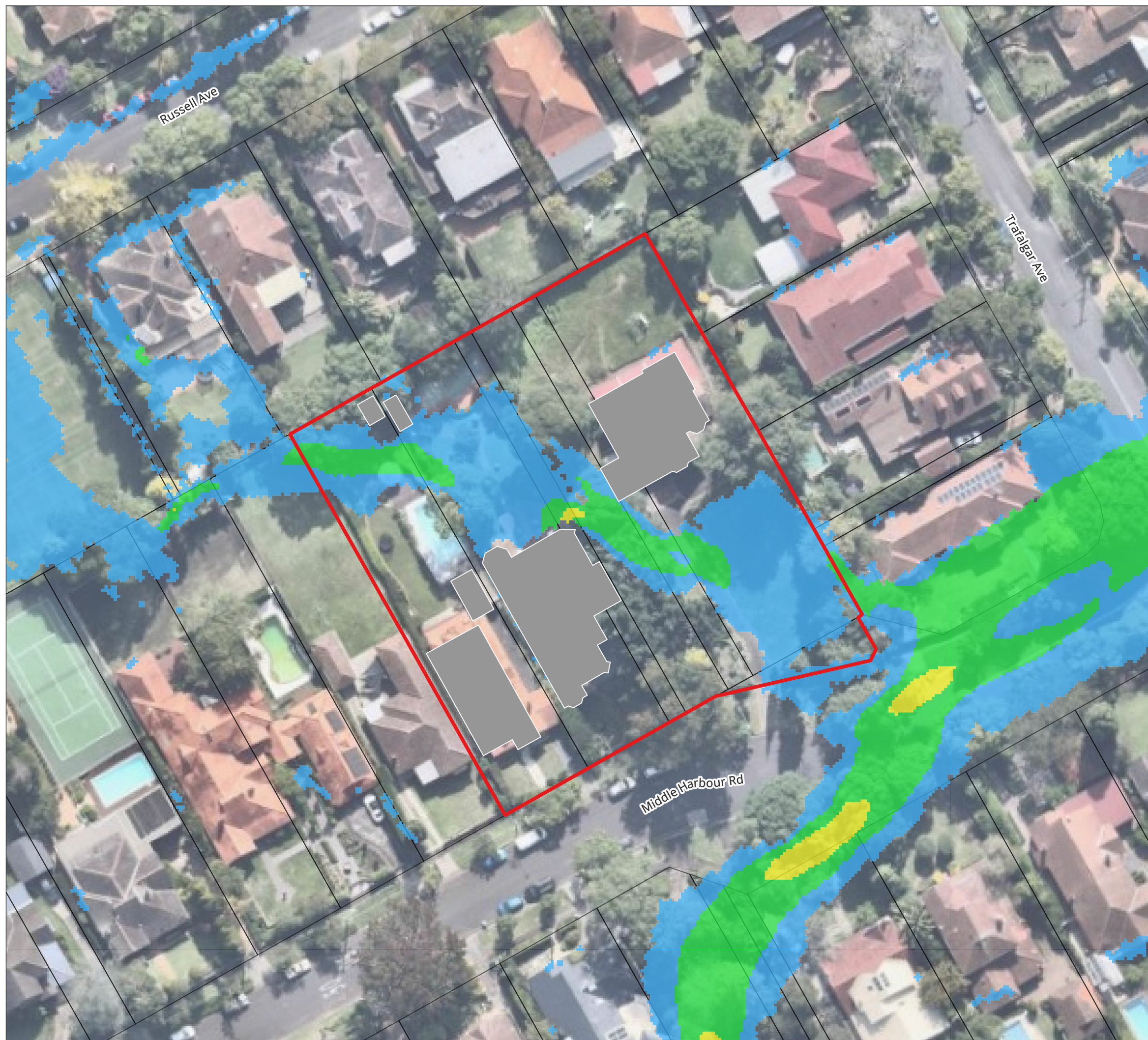
CIVIL | WATER | ENVIRONMENT

Appendix A-20

Pre-Development
Peak Flood Depth * Velocity
0.2% AEP

LEGEND

- Site Location
 - Existing Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



24-28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-21

Pre-Development
Peak Flood Depth + Flood Level
Contours
PMF

LEGEND

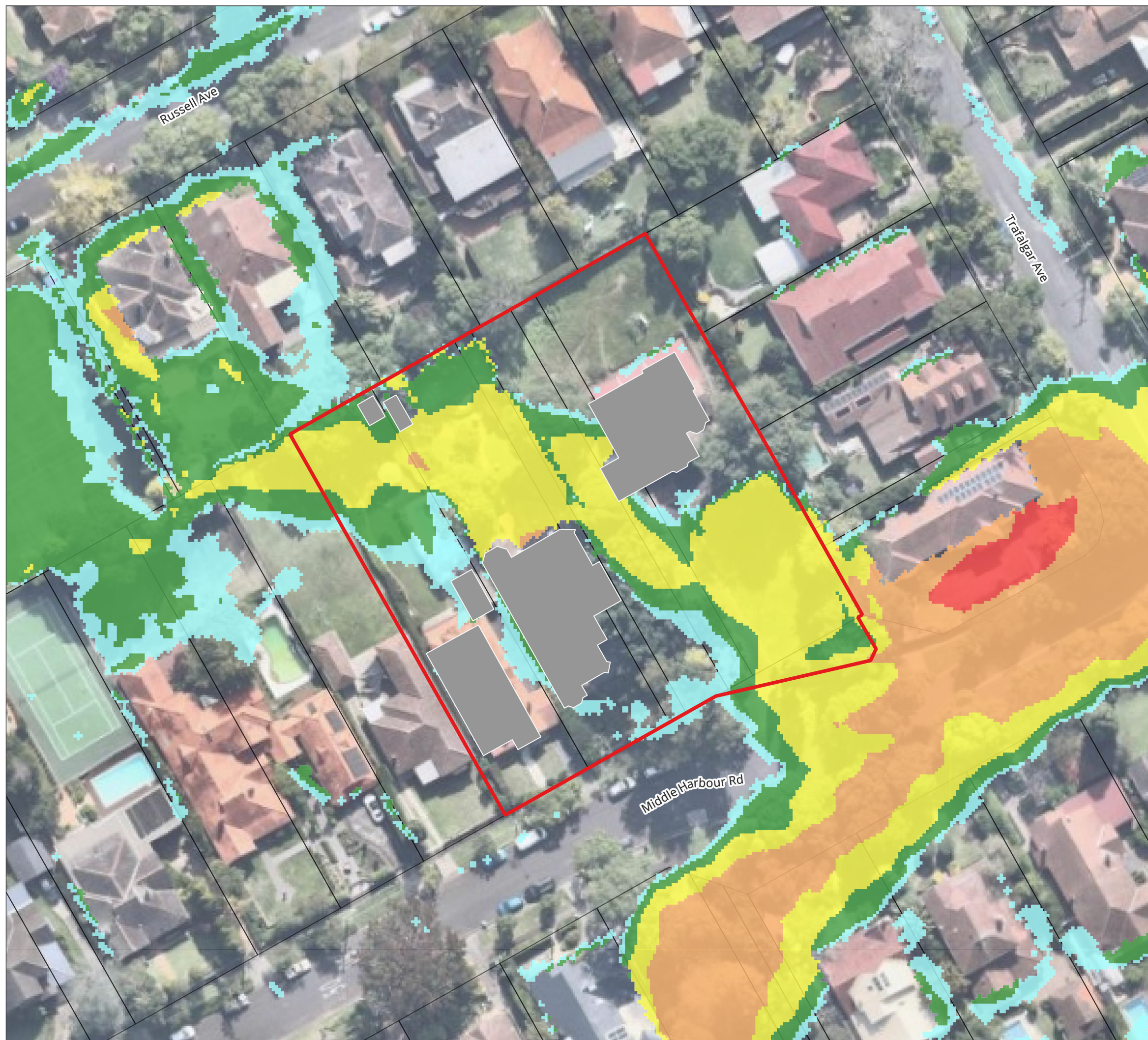
- Site Location
- Existing Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



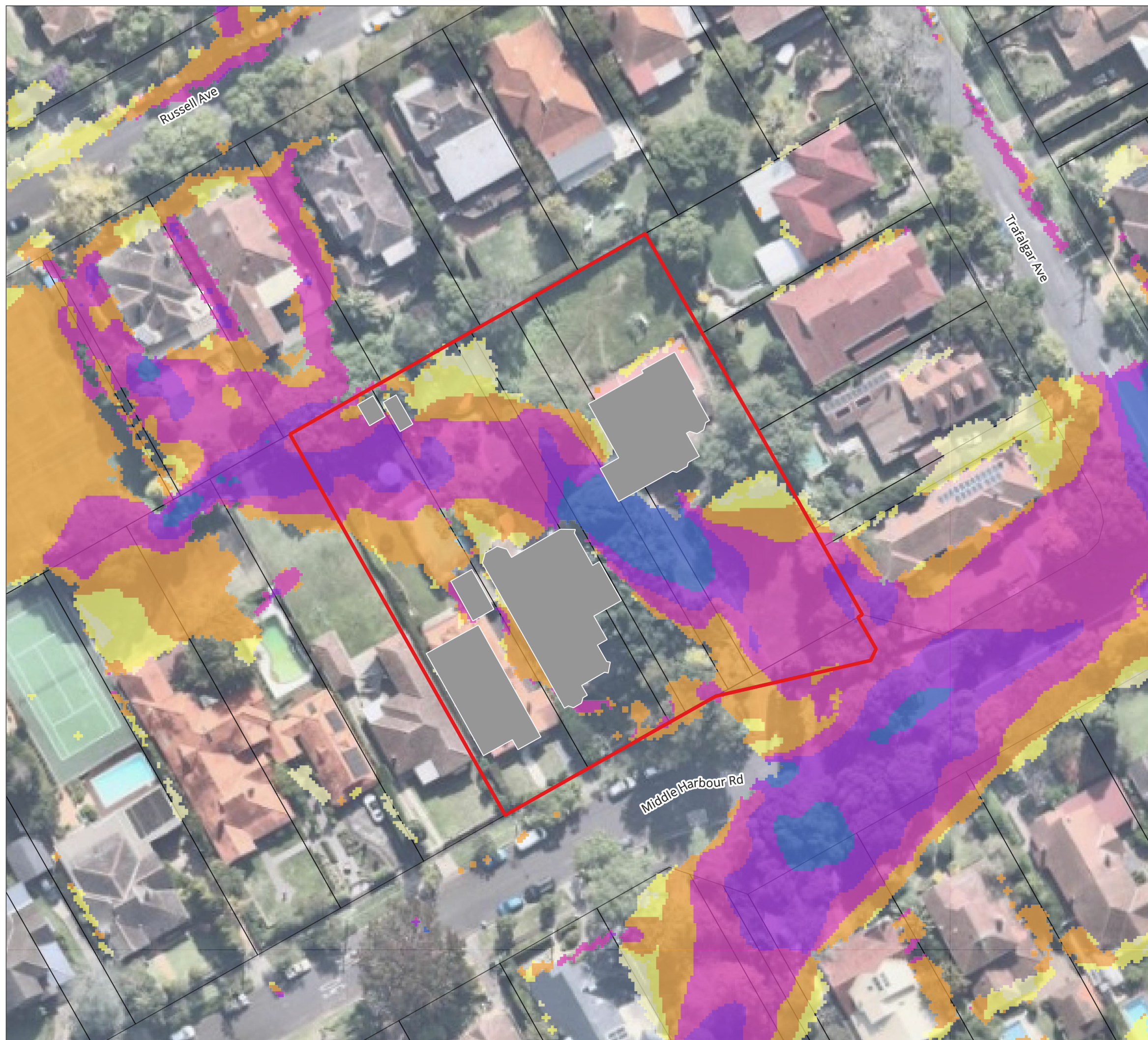
CIVIL | WATER | ENVIRONMENT

Appendix A-22

Pre-Development Peak Flood Velocity PMF

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



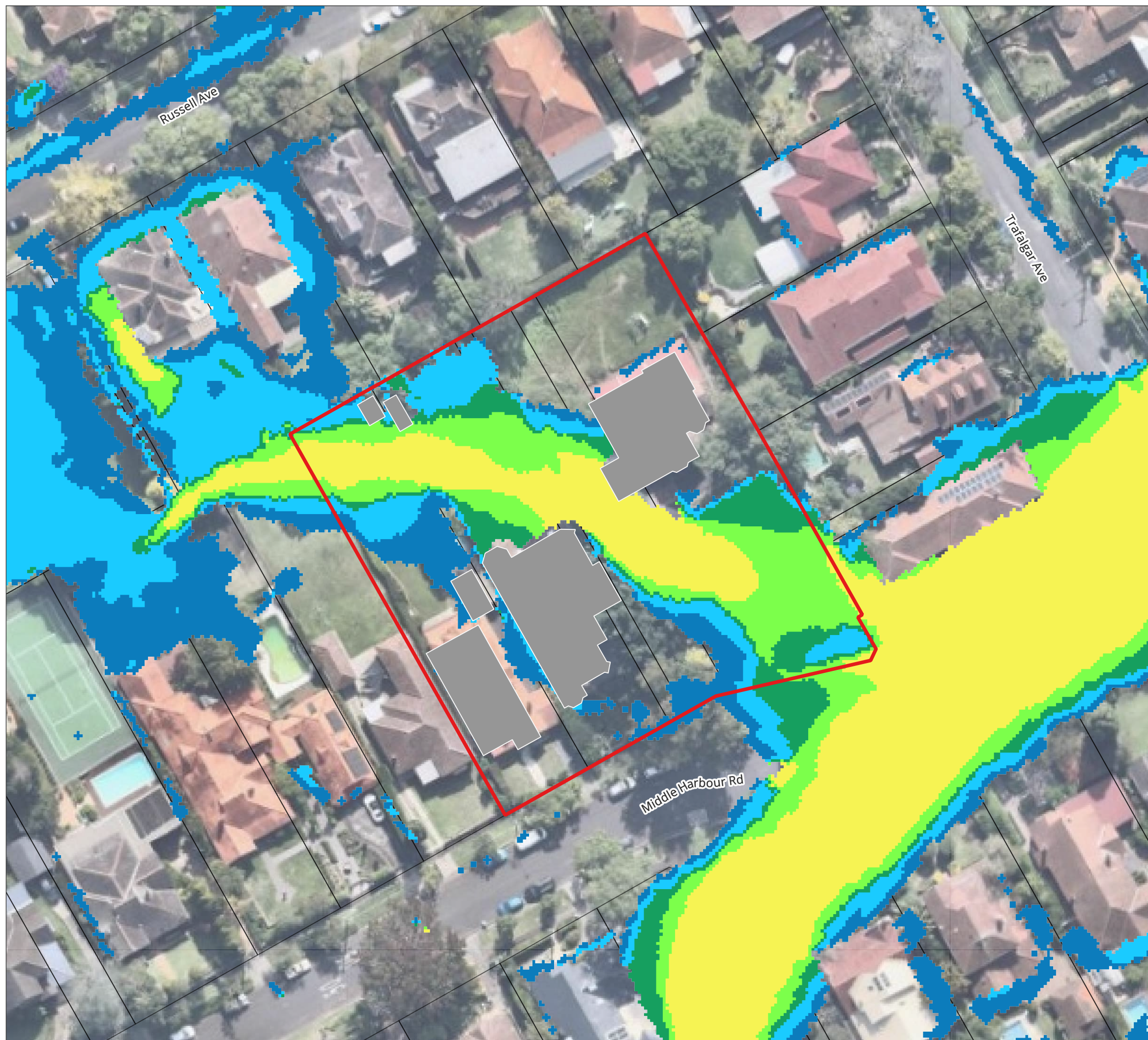
CIVIL | WATER | ENVIRONMENT

Appendix A-23

Pre-Development Flood Hazard Classification PMF

LEGEND

- Site Location
 - Existing Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix A-24

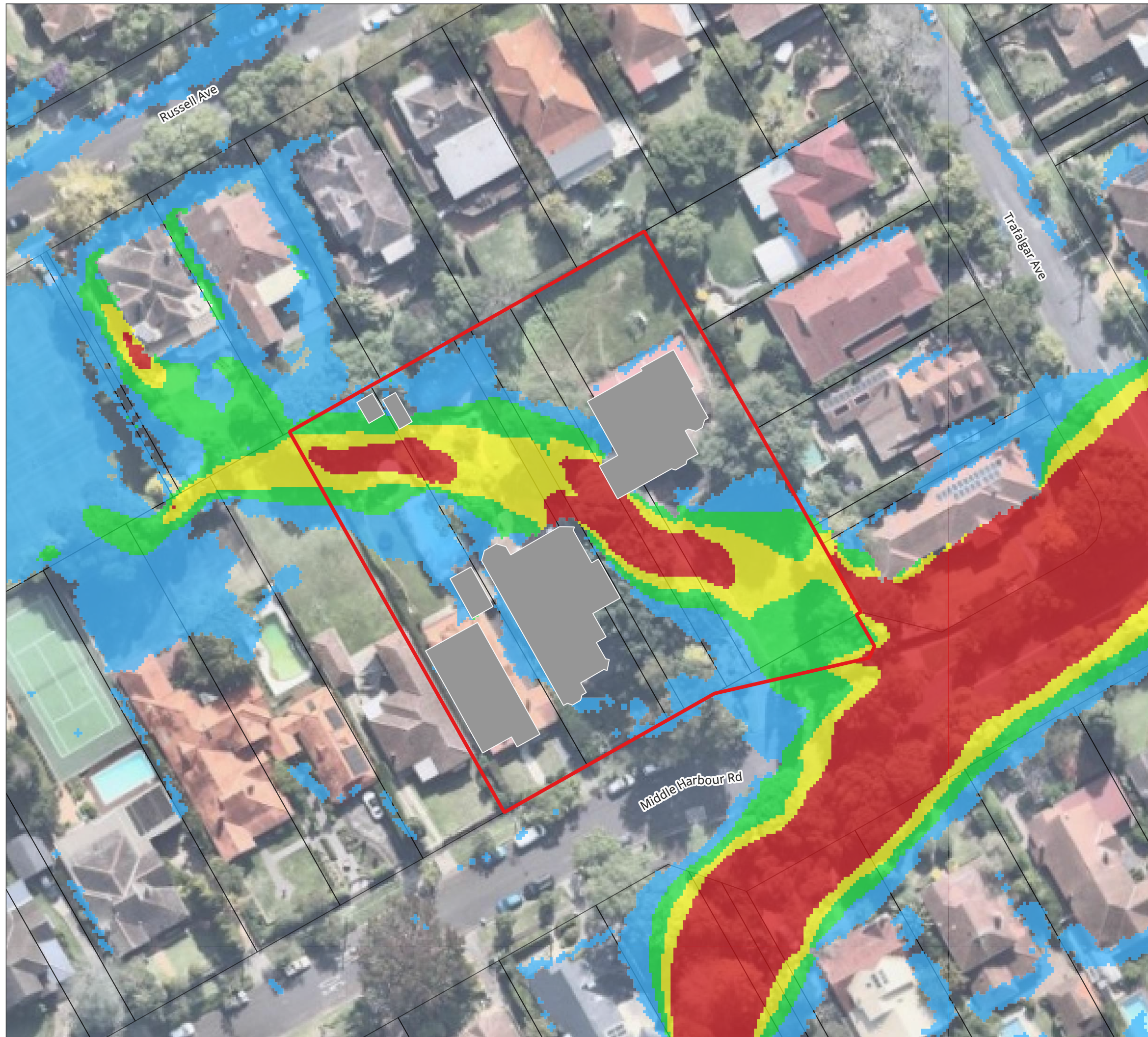
Pre-Development
Peak Flood Depth * Velocity
PMF

LEGEND

- Site Location
- Existing Building Footprint
- Cadastre

Peak Flood Depth x Velocity

- ≤ 0.4
- $0.4 - 0.8$
- $0.8 - 1.2$
- > 1.2



24-28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m

APPENDIX B

POST-DEVELOPMENT FLOOD MAPPING



CIVIL | WATER | ENVIRONMENT

Appendix B-1

Post-Development
Peak Flood Depth + Flood Level
Contours
10% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



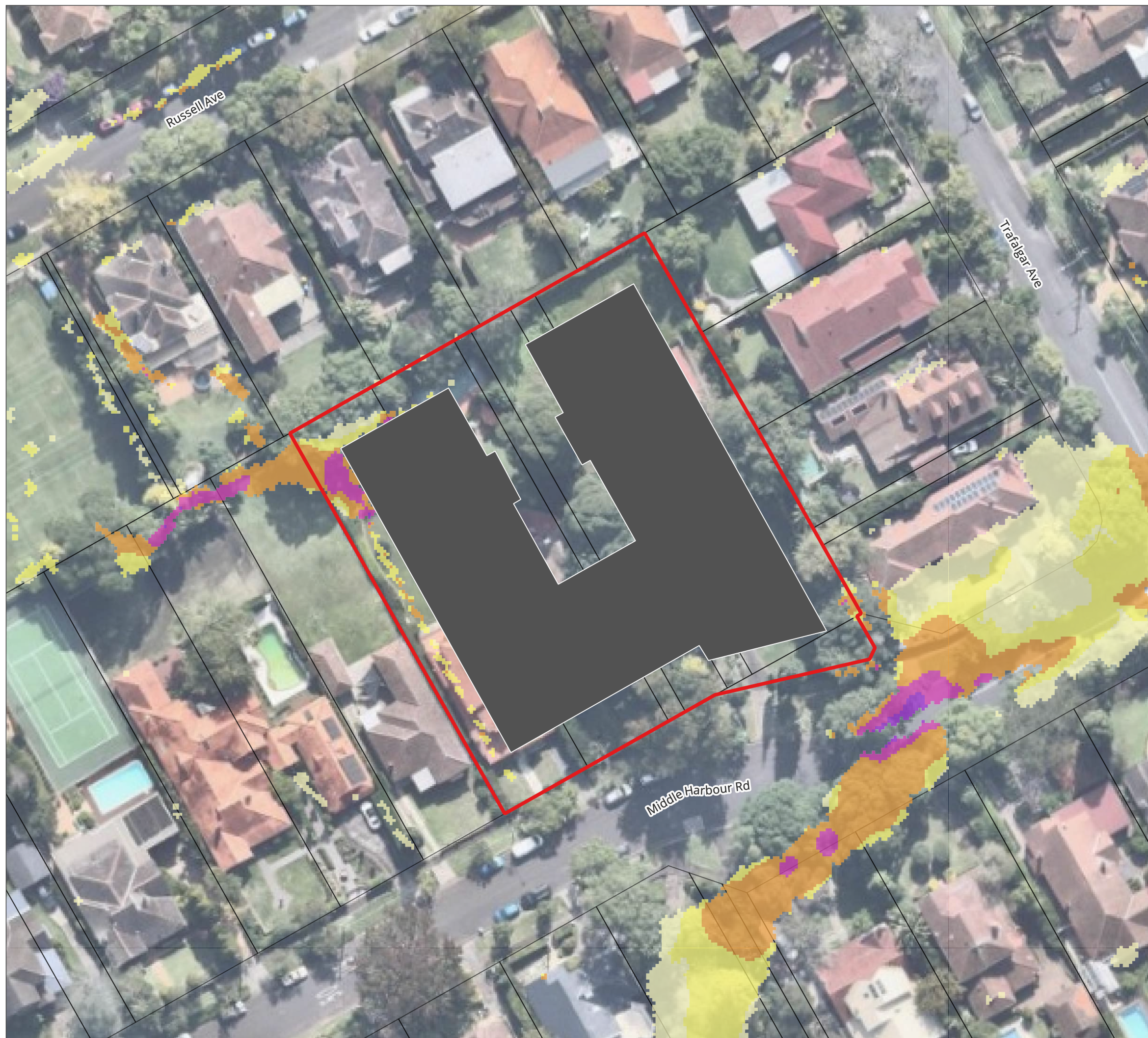
CIVIL | WATER | ENVIRONMENT

Appendix B-2

Post-Development
Peak Flood Velocity
10% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



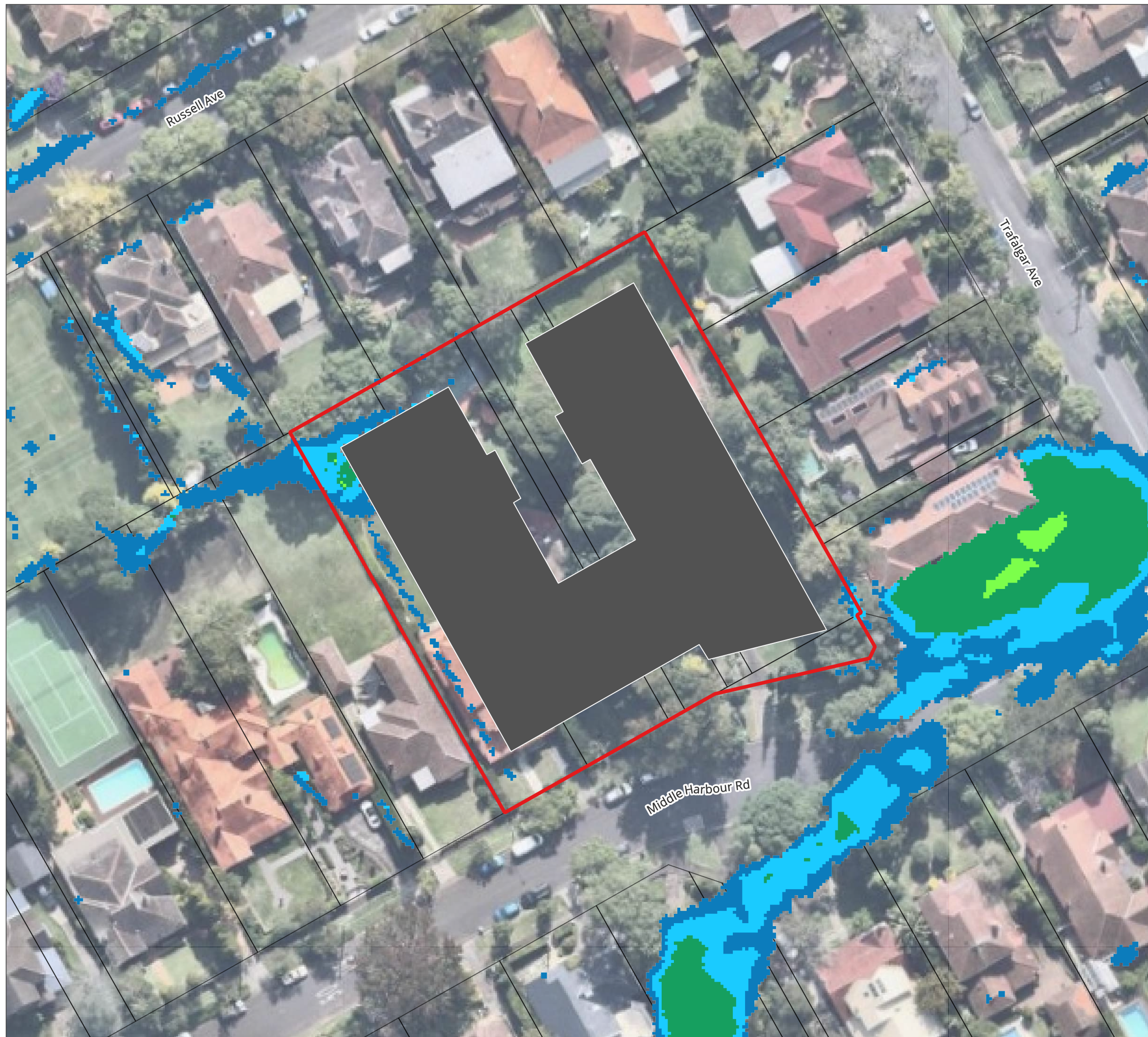
CIVIL | WATER | ENVIRONMENT

Appendix B-3

Post-Development Flood Hazard Classification 10% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



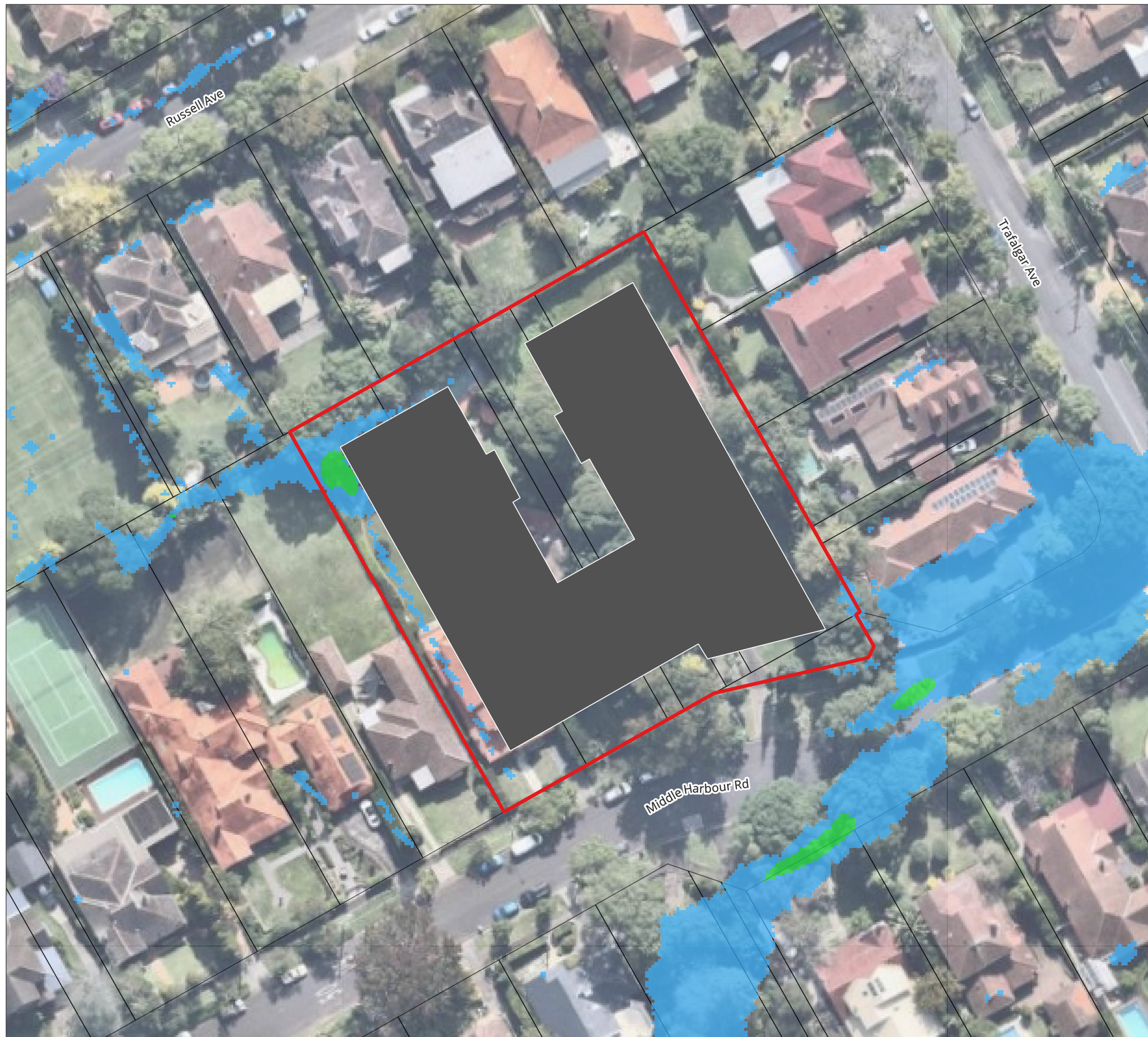
CIVIL | WATER | ENVIRONMENT

Appendix B-4

Post-Development
Peak Flood Depth * Velocity
10% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



28 Middle Harbour Rd
Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-5

Post-Development
Peak Flood Level Afflux
10% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - $-0.40 - -0.30$
 - $-0.30 - -0.20$
 - $-0.20 - -0.10$
 - $-0.10 - -0.05$
 - $-0.05 - 0.05$
 - $0.05 - 0.10$
 - $0.10 - 0.20$
 - $0.20 - 0.30$
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-6

Post-Development
Peak Flood Hazard Afflux
10% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Hazard Afflux
- 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

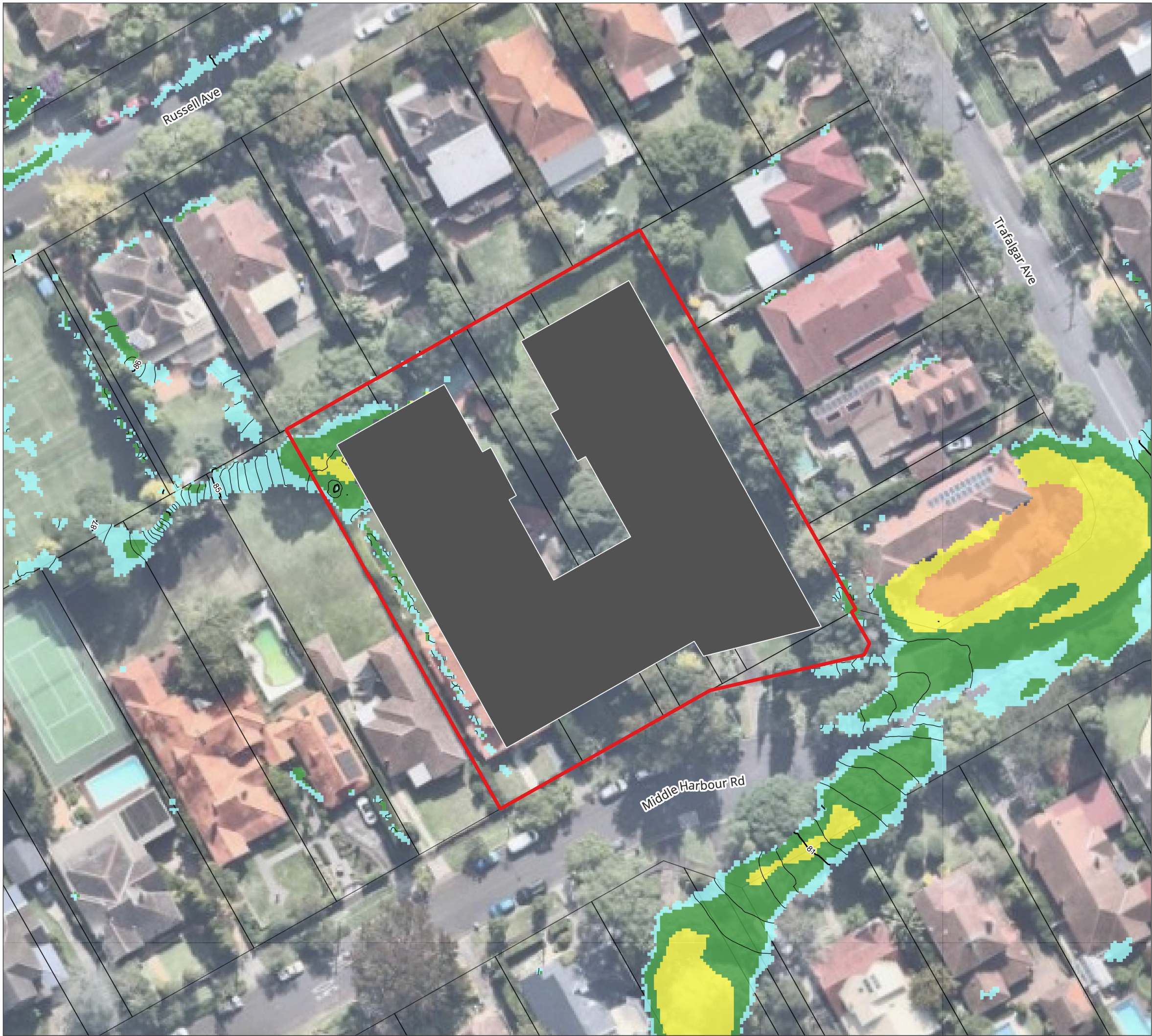
Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-7
Post-Development
Peak Flood Depth + Flood Level
Contours
5% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Water Level Contours (mAHD)
 - Minor (0.10m)
 - Major (1.0m)
- Flood Depth (m)
 - 0.15 - 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 2.00
 - > 2.00

28 Middle Harbour Rd
Lindfield FIA



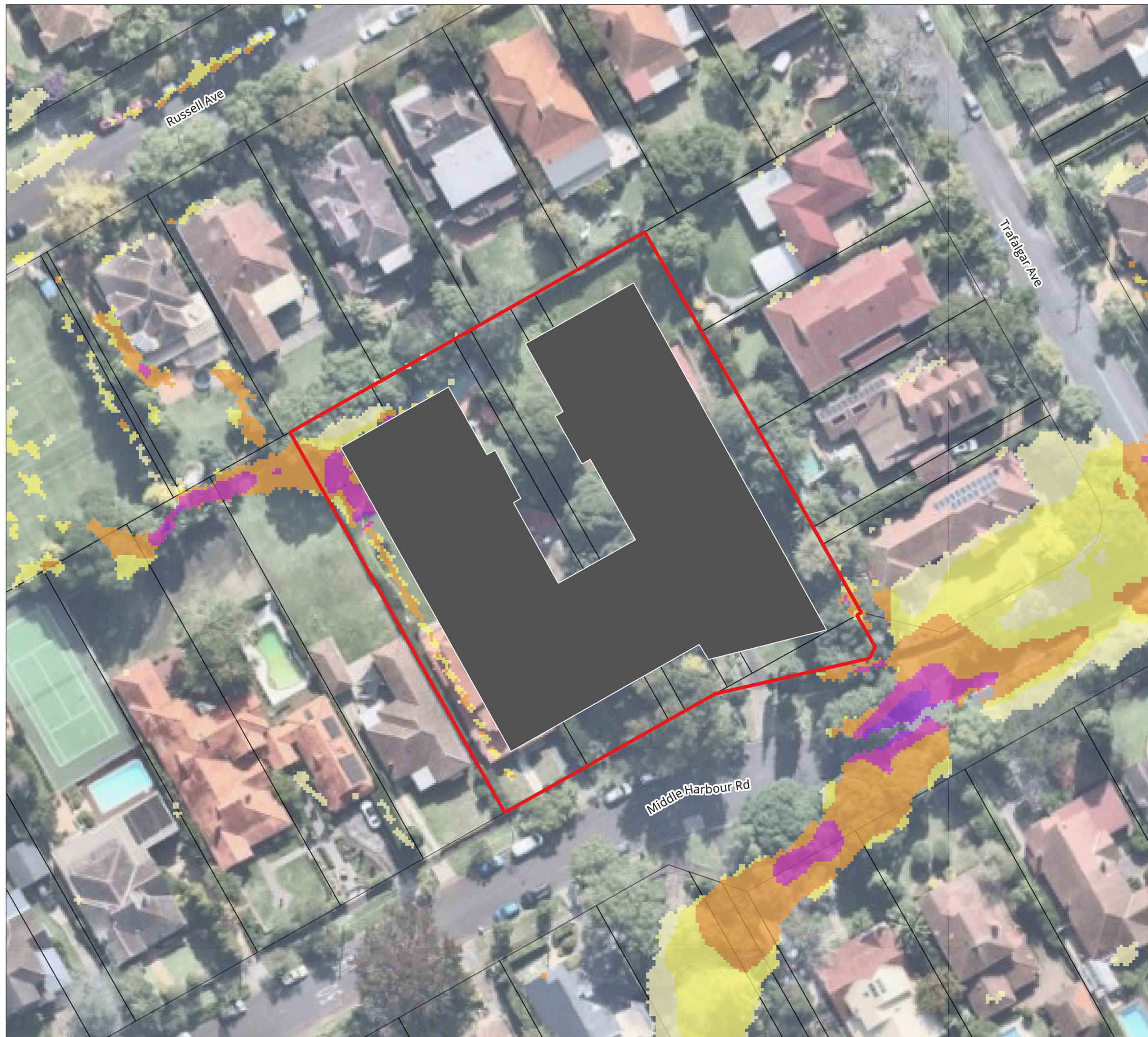
CIVIL | WATER | ENVIRONMENT

Appendix B-8

Post-Development
Peak Flood Velocity
5% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



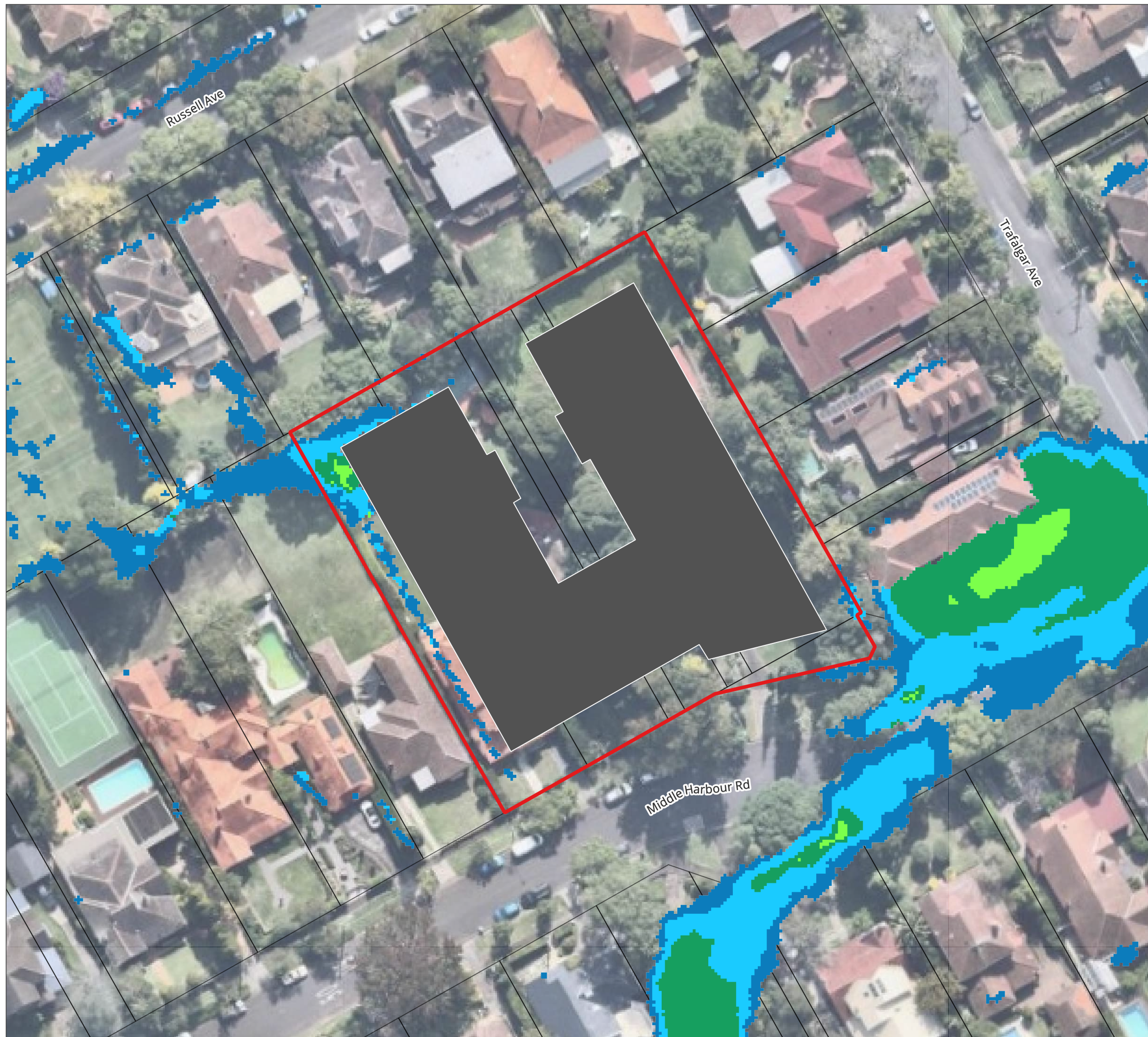
CIVIL | WATER | ENVIRONMENT

Appendix B-9

Post-Development Flood Hazard Classification 5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



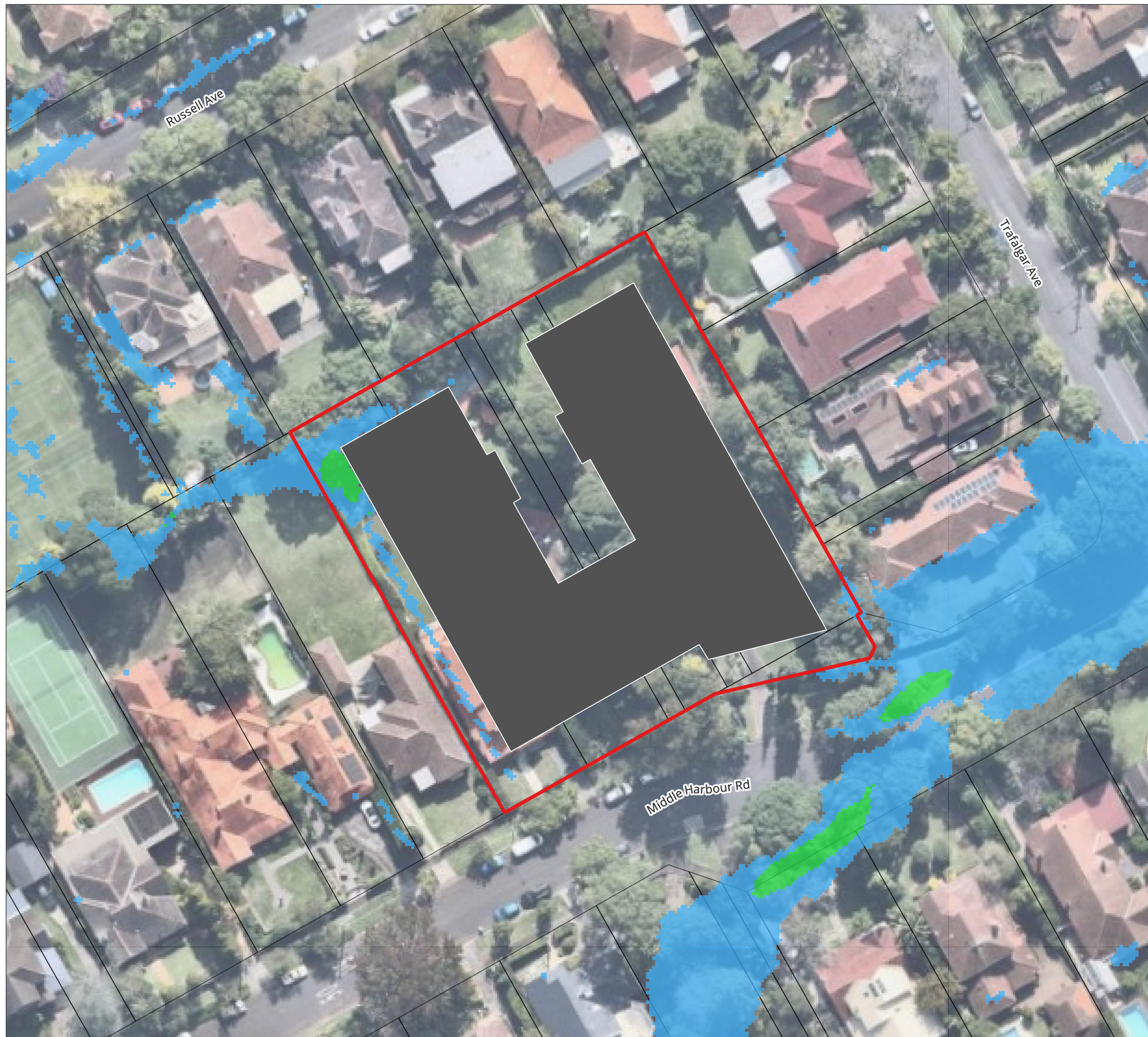
CIVIL | WATER | ENVIRONMENT

Appendix B-10

Post-Development
Peak Flood Depth * Velocity
5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-11

Post-Development
Peak Flood Level Afflux
5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - $-0.40 - -0.30$
 - $-0.30 - -0.20$
 - $-0.20 - -0.10$
 - $-0.10 - -0.05$
 - $-0.05 - 0.05$
 - $0.05 - 0.10$
 - $0.10 - 0.20$
 - $0.20 - 0.30$
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-12

Post-Development
Peak Flood Hazard Afflux
5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Hazard Afflux
- 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - Was Wet, Now Dry
 - Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA



A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-13

Post-Development
Peak Flood Depth + Flood Level
Contours
1% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025



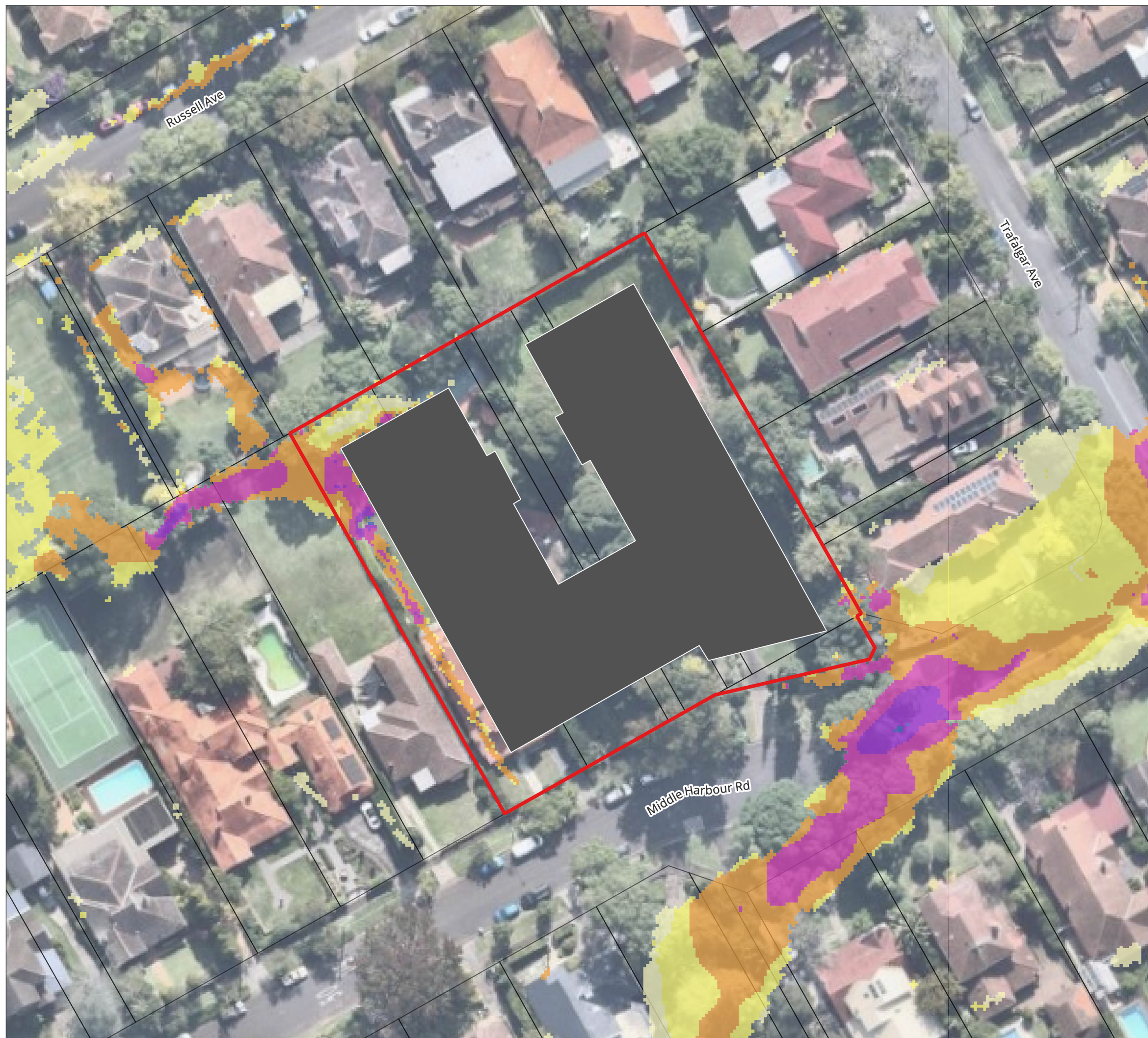
CIVIL | WATER | ENVIRONMENT

Appendix B-14

Post-Development
Peak Flood Velocity
1% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



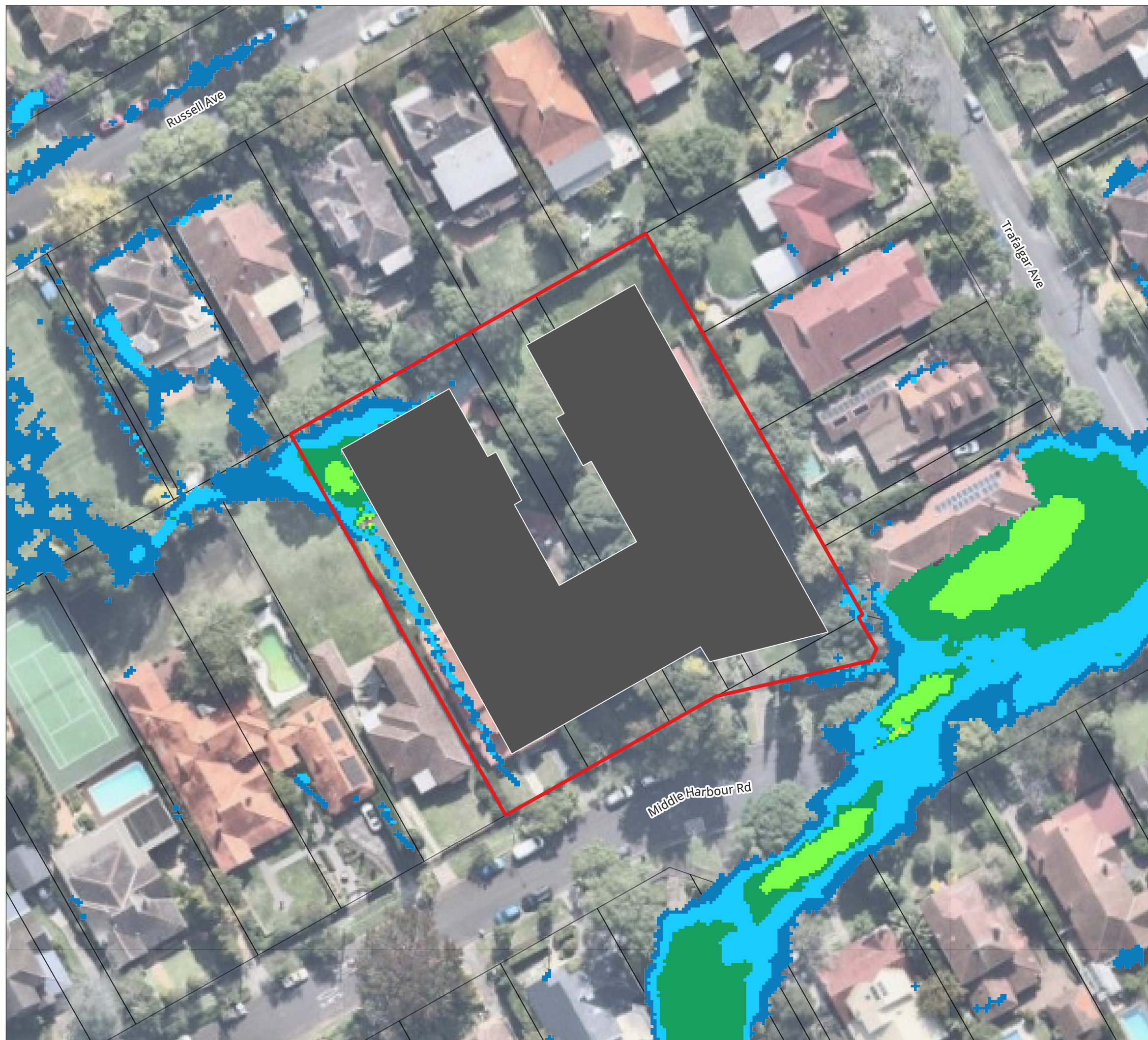
CIVIL | WATER | ENVIRONMENT

Appendix B-15

Post-Development
Flood Hazard Classification
1% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Hazard Classification**
 - H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

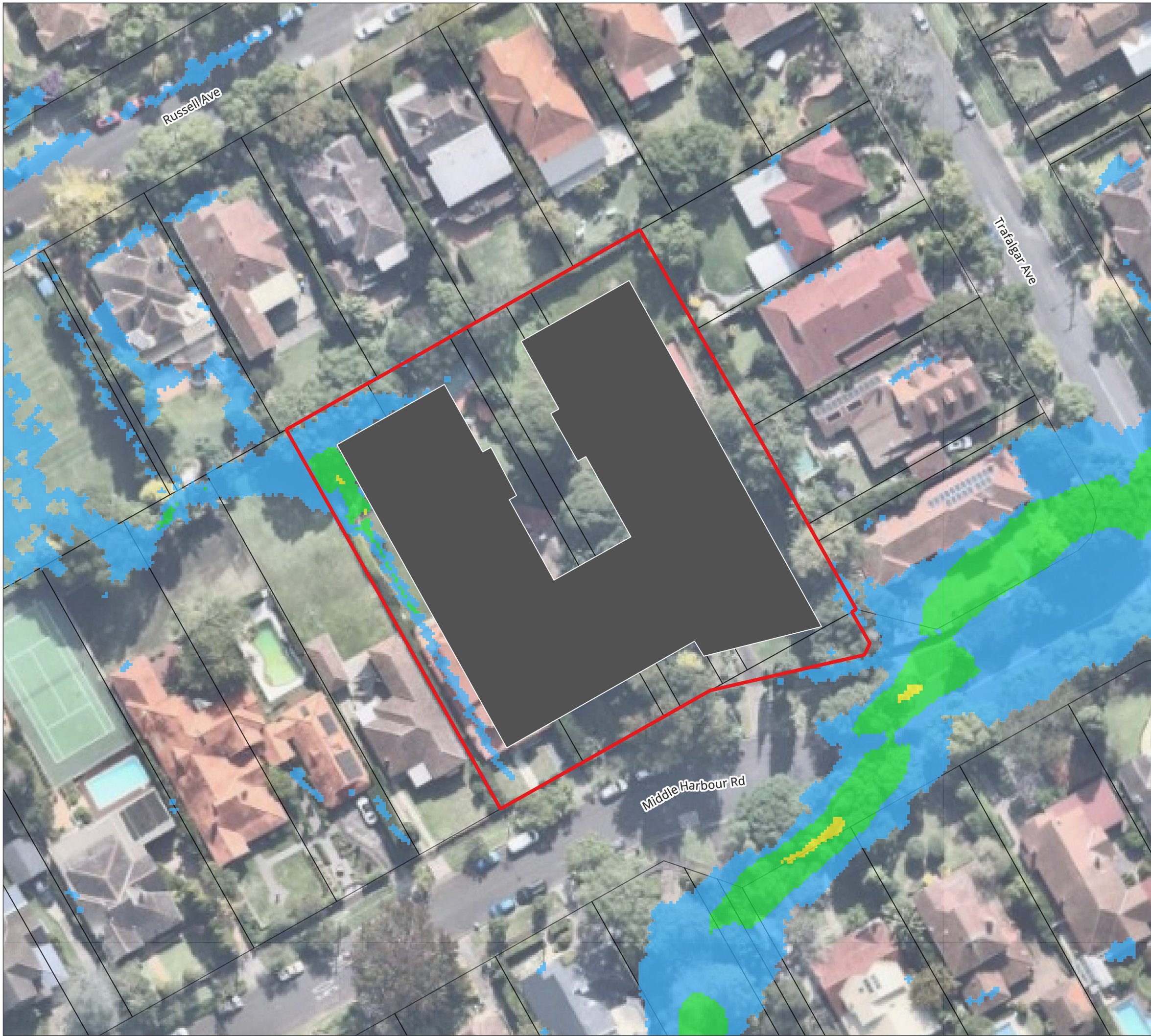
Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix B-16

Post-Development
Peak Flood Depth * Velocity
1% AEP

LEGEND

-  Site Location
-  Proposed Building Footprint
-  Cadastre
- Peak Flood Depth x Velocity
 -  <= 0.4
 -  0.4 - 0.8
 -  0.8 - 1.2
 -  > 1.2

28 Middle Harbour Rd
Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-17

Post-Development
Peak Flood Level Afflux
1% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - $-0.40 - -0.30$
 - $-0.30 - -0.20$
 - $-0.20 - -0.10$
 - $-0.10 - -0.05$
 - $-0.05 - 0.05$
 - $0.05 - 0.10$
 - $0.10 - 0.20$
 - $0.20 - 0.30$
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025



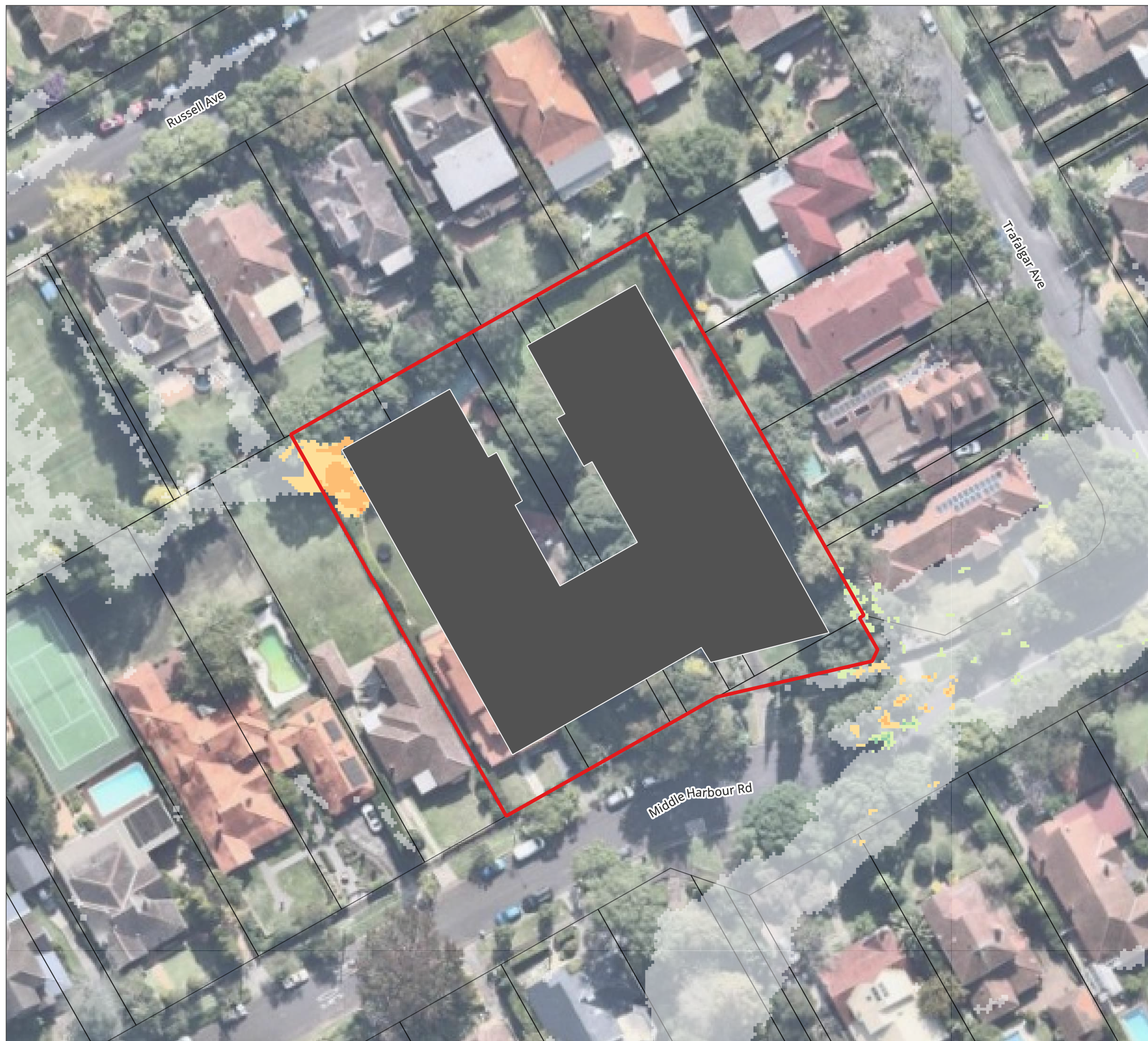
CIVIL | WATER | ENVIRONMENT

Appendix B-18

Post-Development
Peak Flood Hazard Afflux
1% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Hazard Afflux
- 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - Was Wet, Now Dry
 - Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-19

Post-Development
Peak Flood Depth + Flood Level
Contours
0.5% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



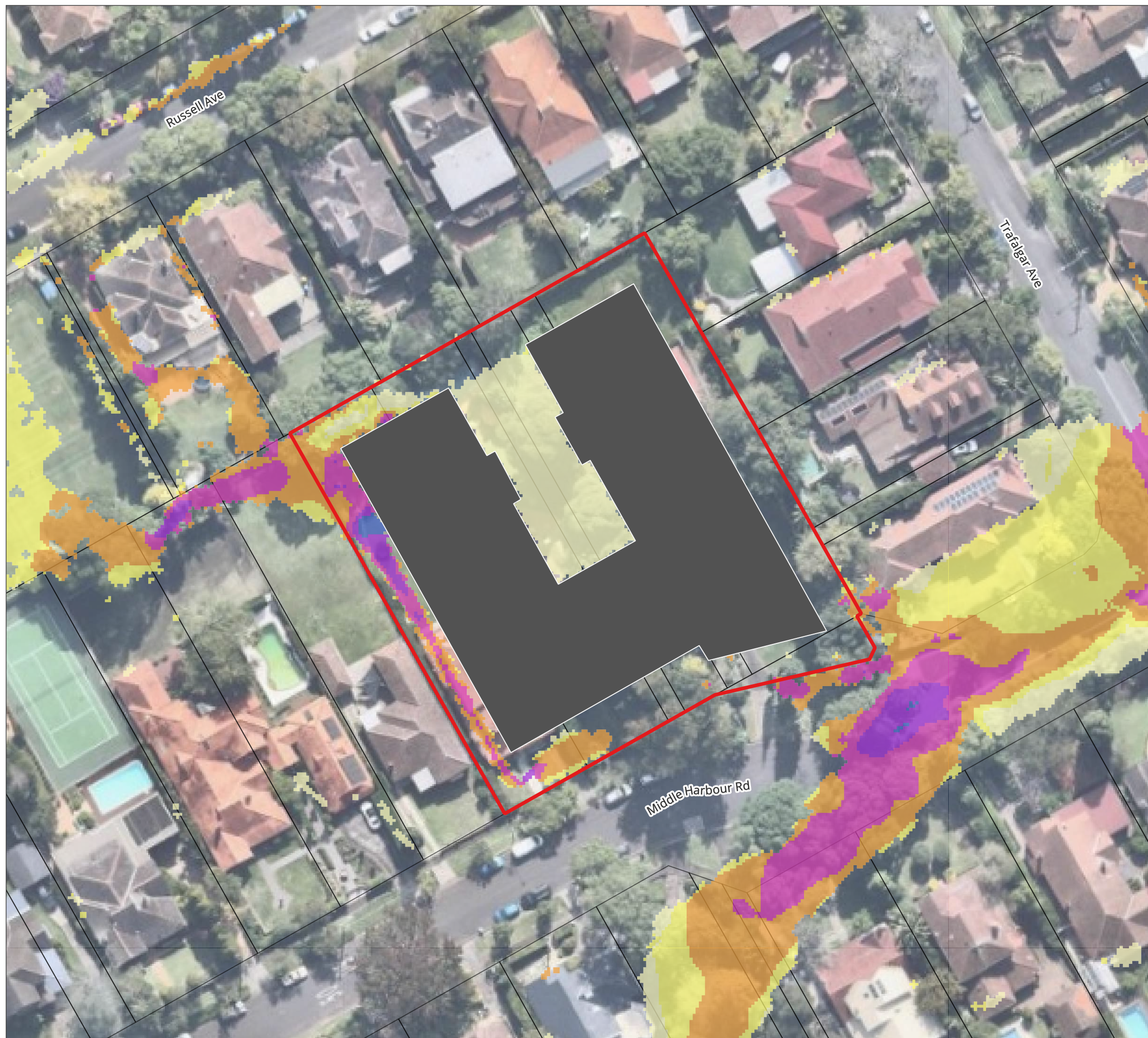
CIVIL | WATER | ENVIRONMENT

Appendix B-20

Post-Development
Peak Flood Velocity
0.5% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



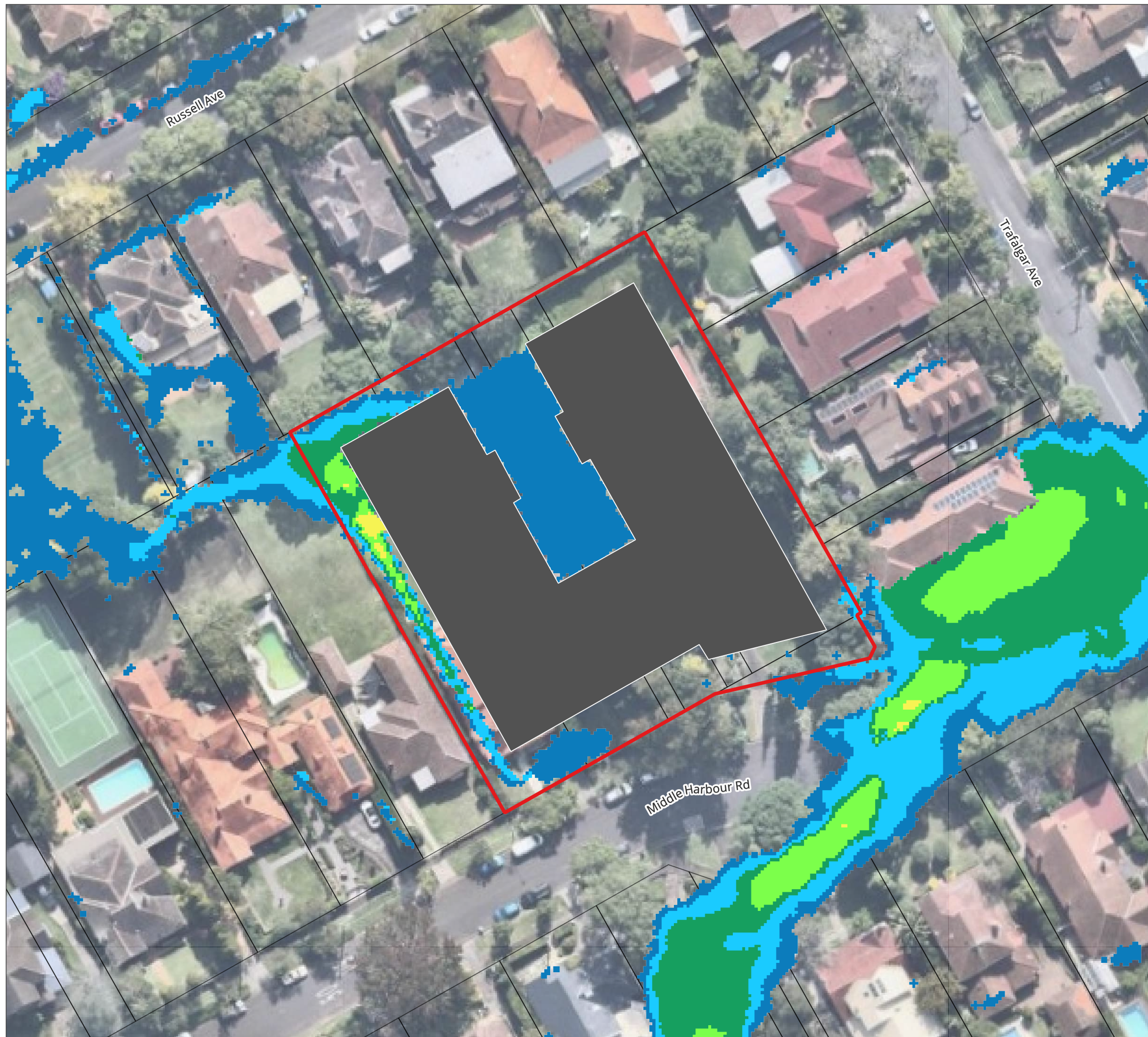
CIVIL | WATER | ENVIRONMENT

Appendix B-21

Post-Development
Flood Hazard Classification
0.5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

Lindfield FIA



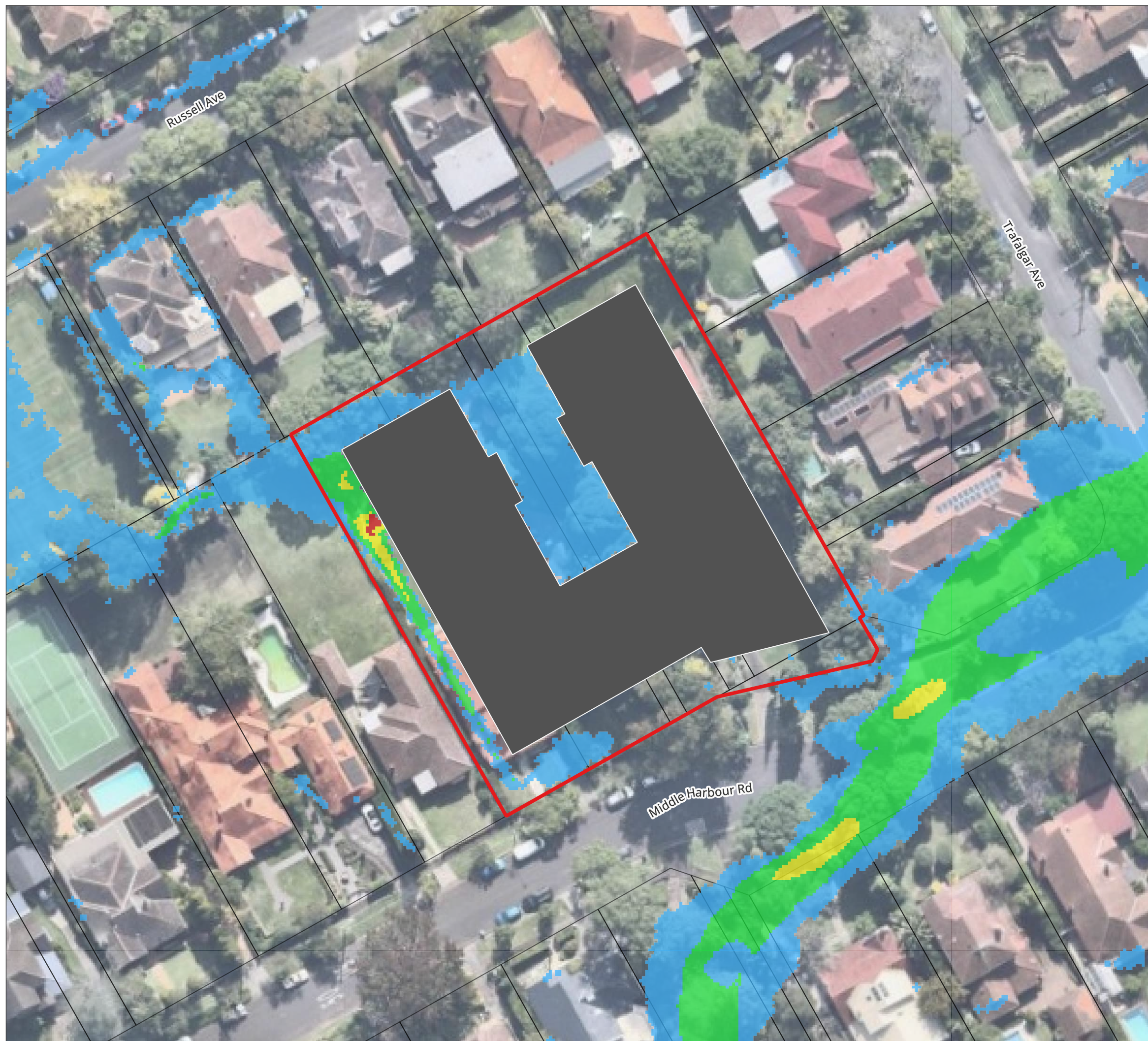
CIVIL | WATER | ENVIRONMENT

Appendix B-22

Post-Development
Peak Flood Depth * Velocity
0.5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-23

Post-Development
Peak Flood Level Afflux
0.5% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - $-0.40 - -0.30$
 - $-0.30 - -0.20$
 - $-0.20 - -0.10$
 - $-0.10 - -0.05$
 - $-0.05 - 0.05$
 - $0.05 - 0.10$
 - $0.10 - 0.20$
 - $0.20 - 0.30$
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



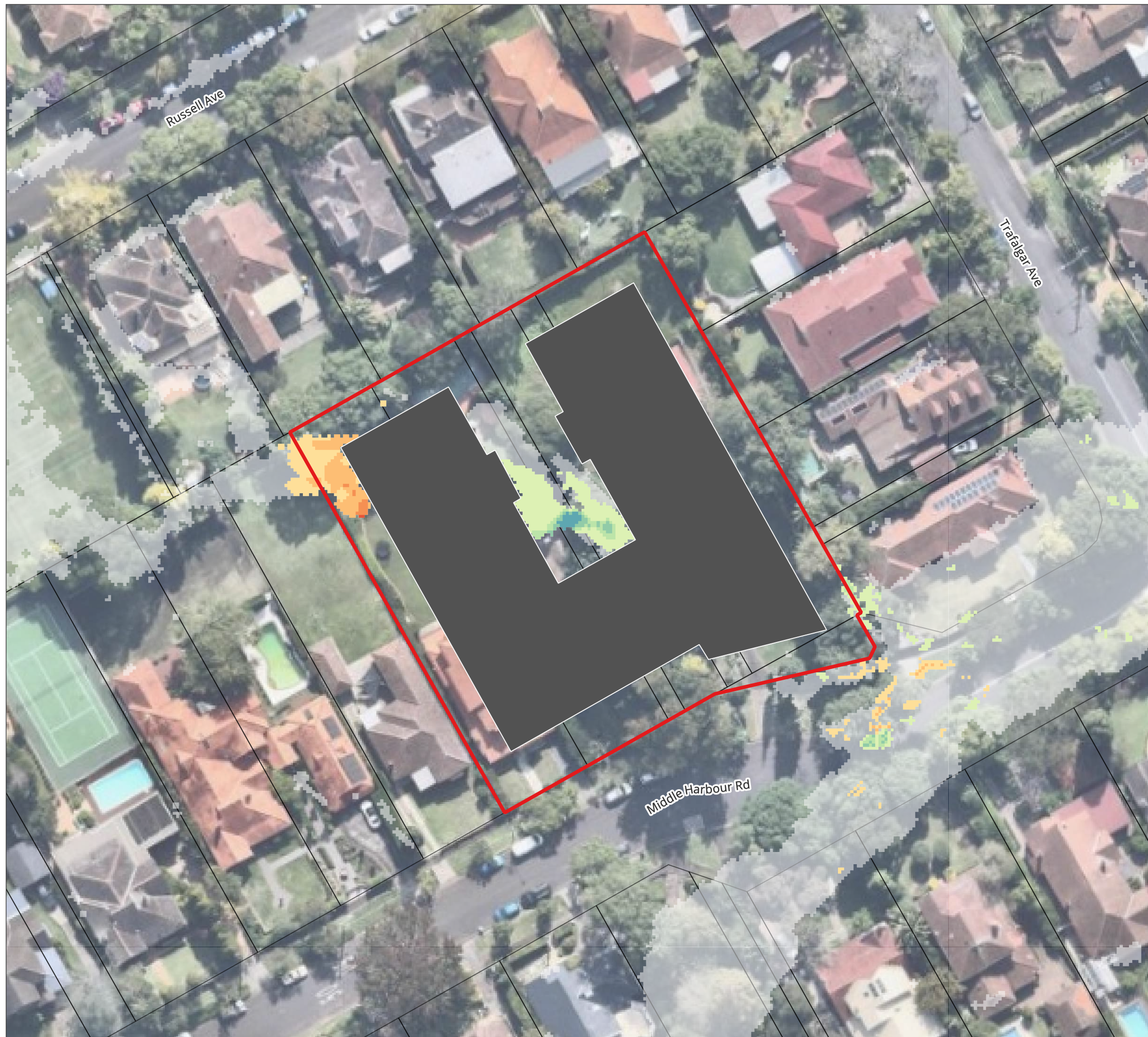
CIVIL | WATER | ENVIRONMENT

Appendix B-24

Post-Development
Peak Flood Hazard Afflux
0.5% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Flood Hazard Afflux
 - 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
- Was Wet, Now Dry
- Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-25

Post-Development
Peak Flood Depth + Flood Level
Contours
0.2% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



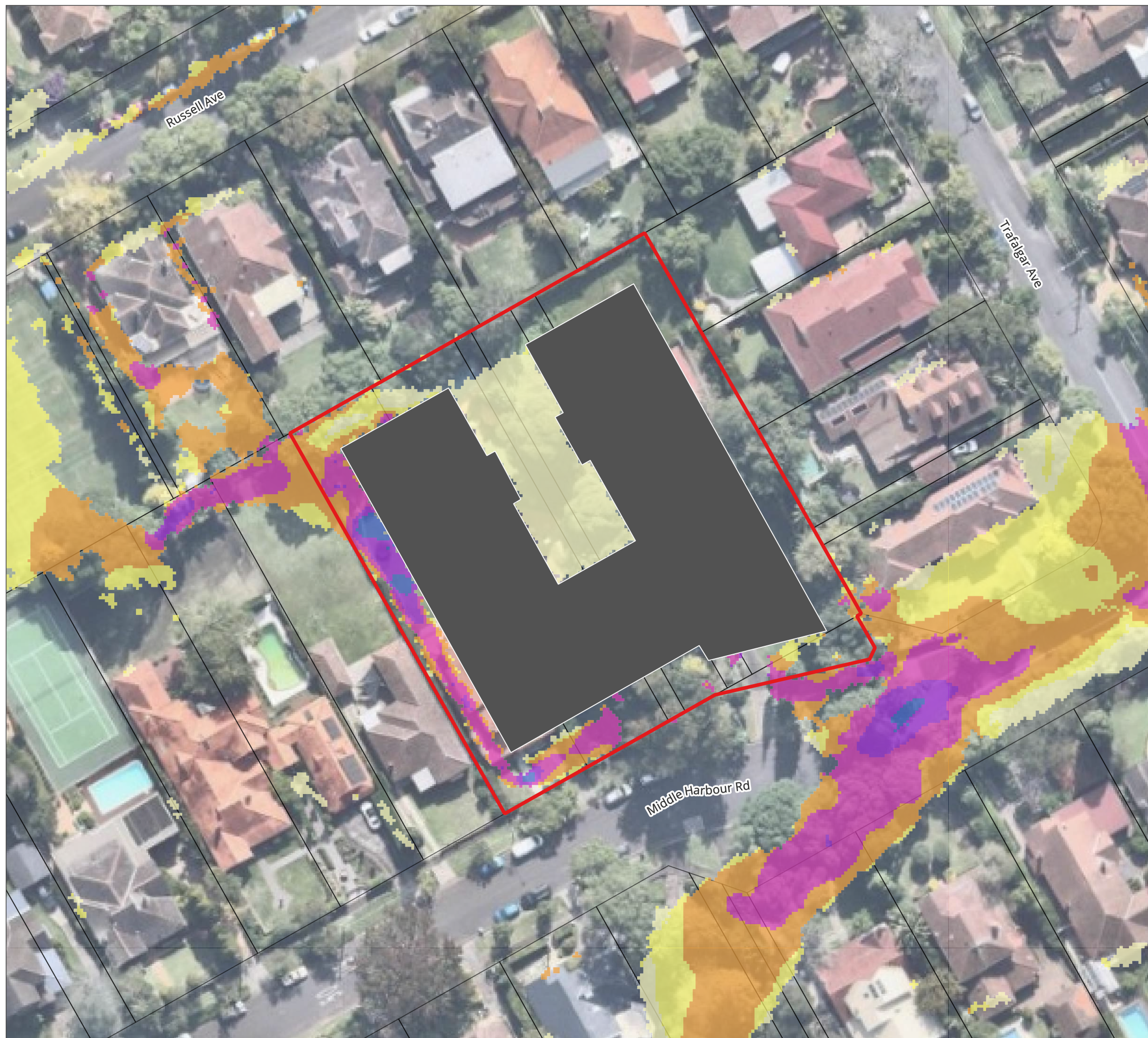
CIVIL | WATER | ENVIRONMENT

Appendix B-26

Post-Development
Peak Flood Velocity
0.2% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



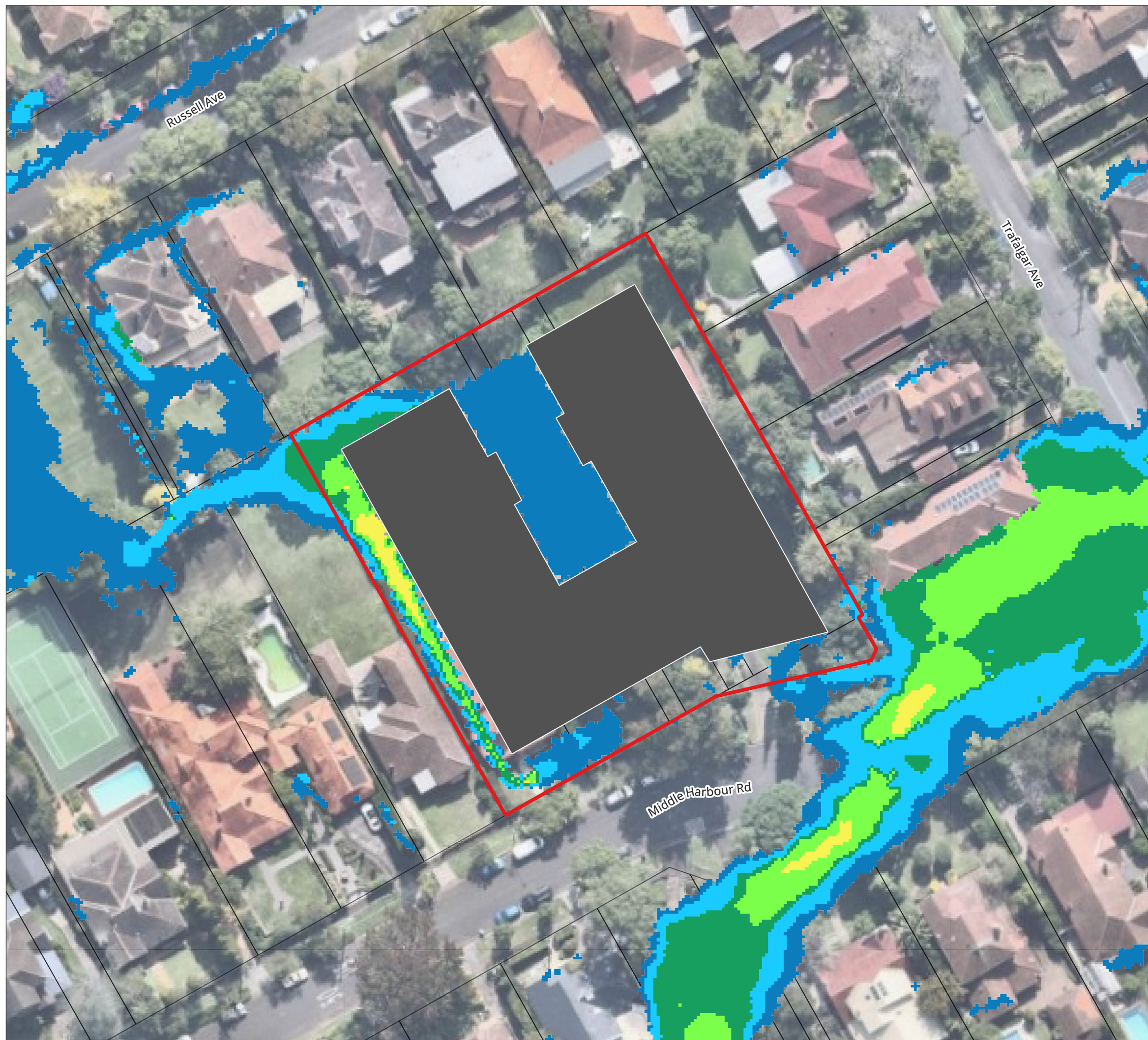
CIVIL | WATER | ENVIRONMENT

Appendix B-27

Post-Development
Flood Hazard Classification
0.2% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

Lindfield FIA



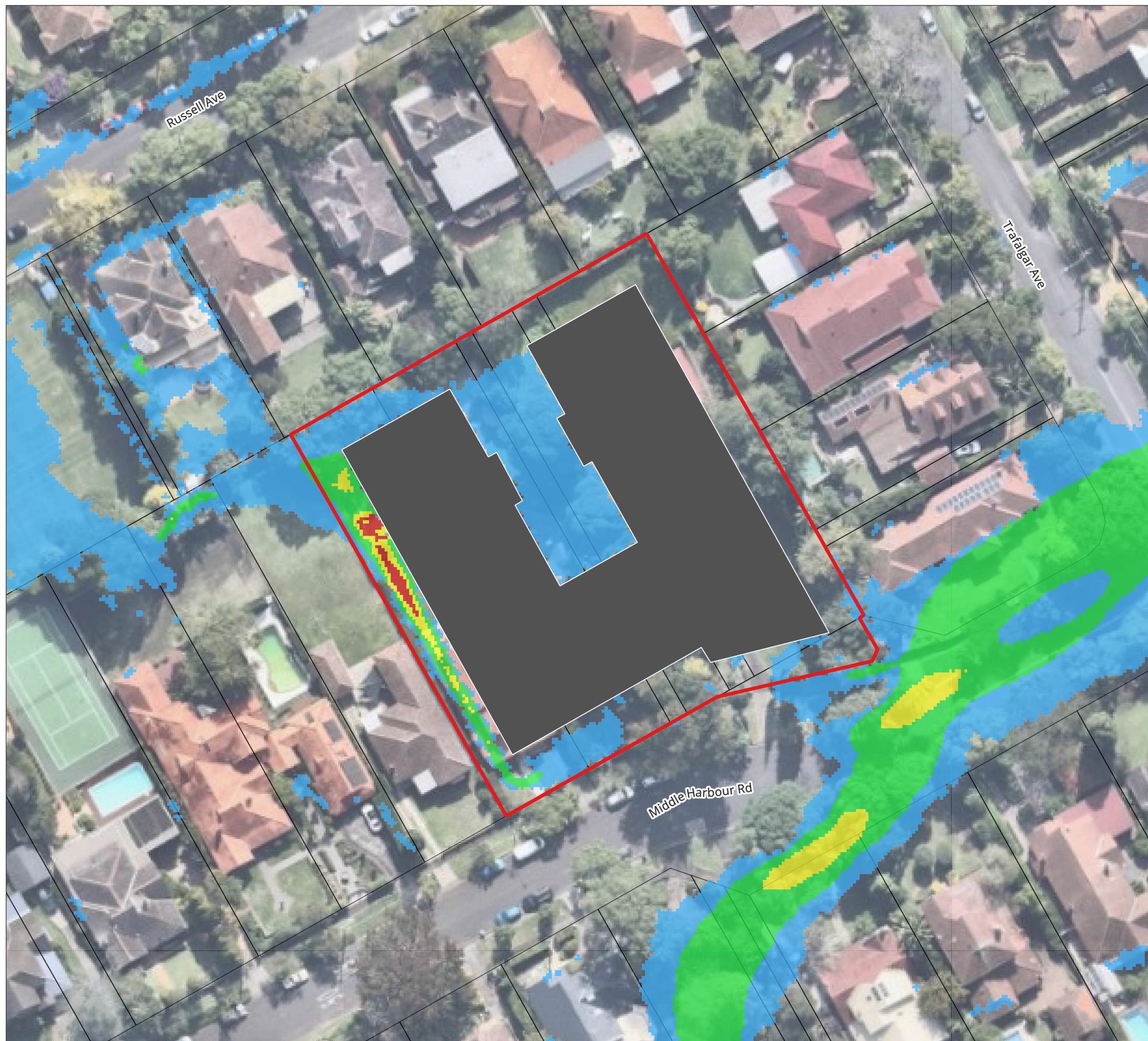
CIVIL | WATER | ENVIRONMENT

Appendix B-28

Post-Development
Peak Flood Depth * Velocity
0.2% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-29

Post-Development
Peak Flood Level Afflux
0.2% AEP

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - 0.40 - -0.30
 - 0.30 - -0.20
 - 0.20 - -0.10
 - 0.10 - -0.05
 - 0.05 - 0.05
 - 0.05 - 0.10
 - 0.10 - 0.20
 - 0.20 - 0.30
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



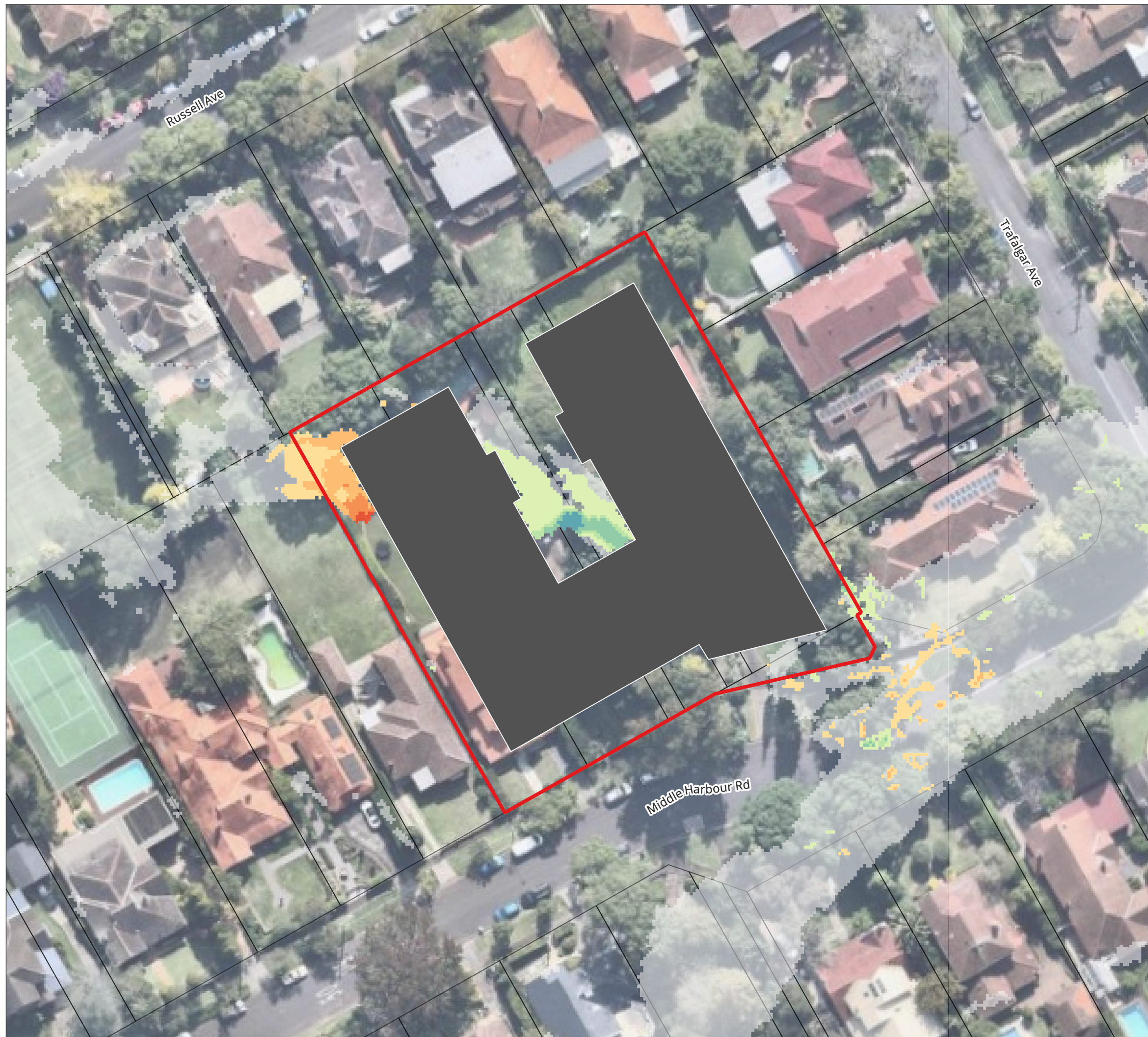
CIVIL | WATER | ENVIRONMENT

Appendix B-30

Post-Development
Peak Flood Hazard Afflux
0.2% AEP

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Flood Hazard Afflux
 - 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
- Was Wet, Now Dry
- Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA



CIVIL | WATER | ENVIRONMENT

Appendix B-31

Post-Development
Peak Flood Depth + Flood Level
Contours
PMF

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Water Level Contours (mAHD)

- Minor (0.10m)
- Major (1.0m)

Flood Depth (m)

- 0.15 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- > 2.00

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



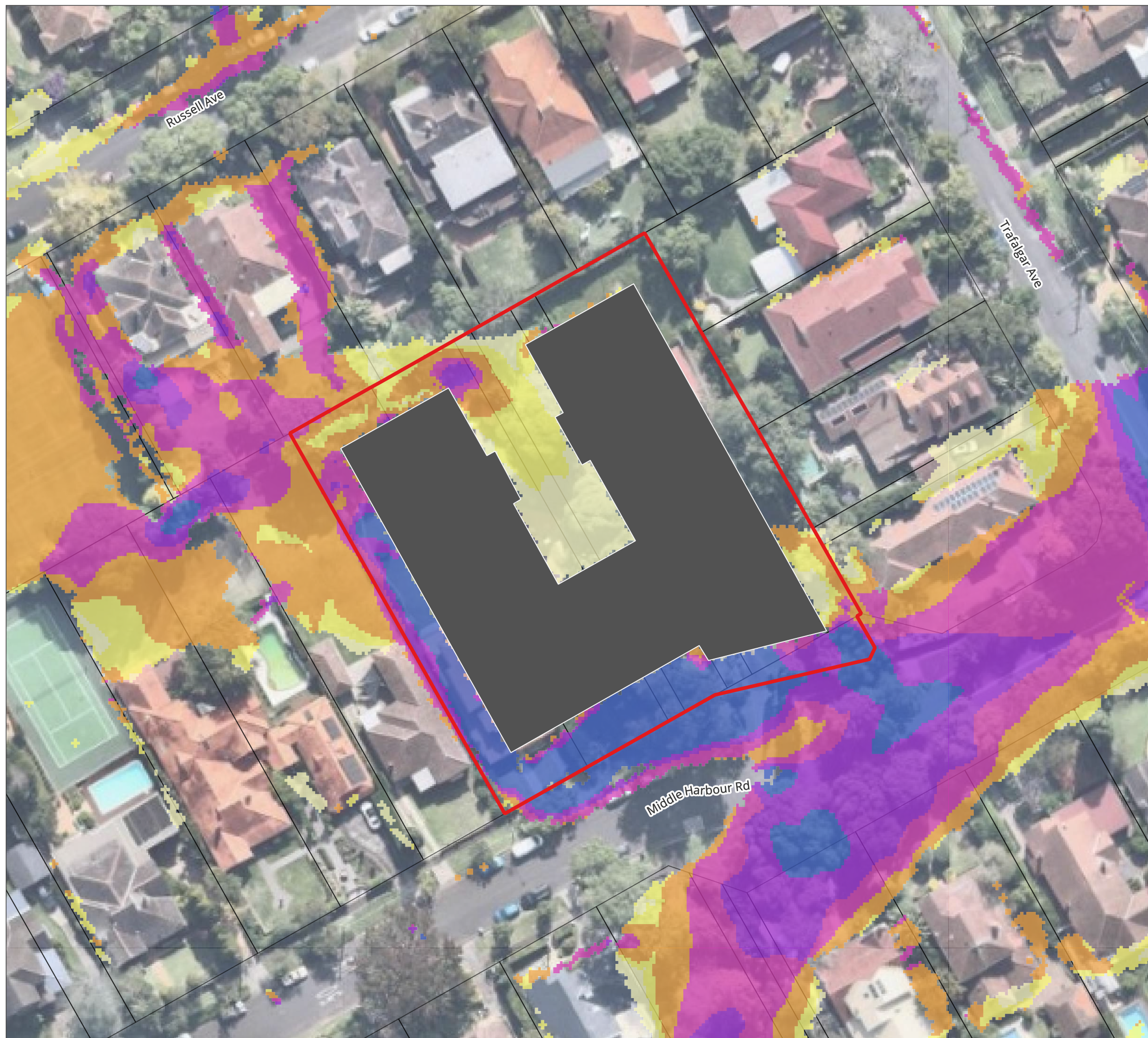
CIVIL | WATER | ENVIRONMENT

Appendix B-32

Post-Development
Peak Flood Velocity
PMF

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Peak Velocity (m/s)
 - ≤ 0.25
 - 0.25 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - 1.50 - 2.00
 - > 2.00



28 Middle Harbour Rd

Lindfield FIA



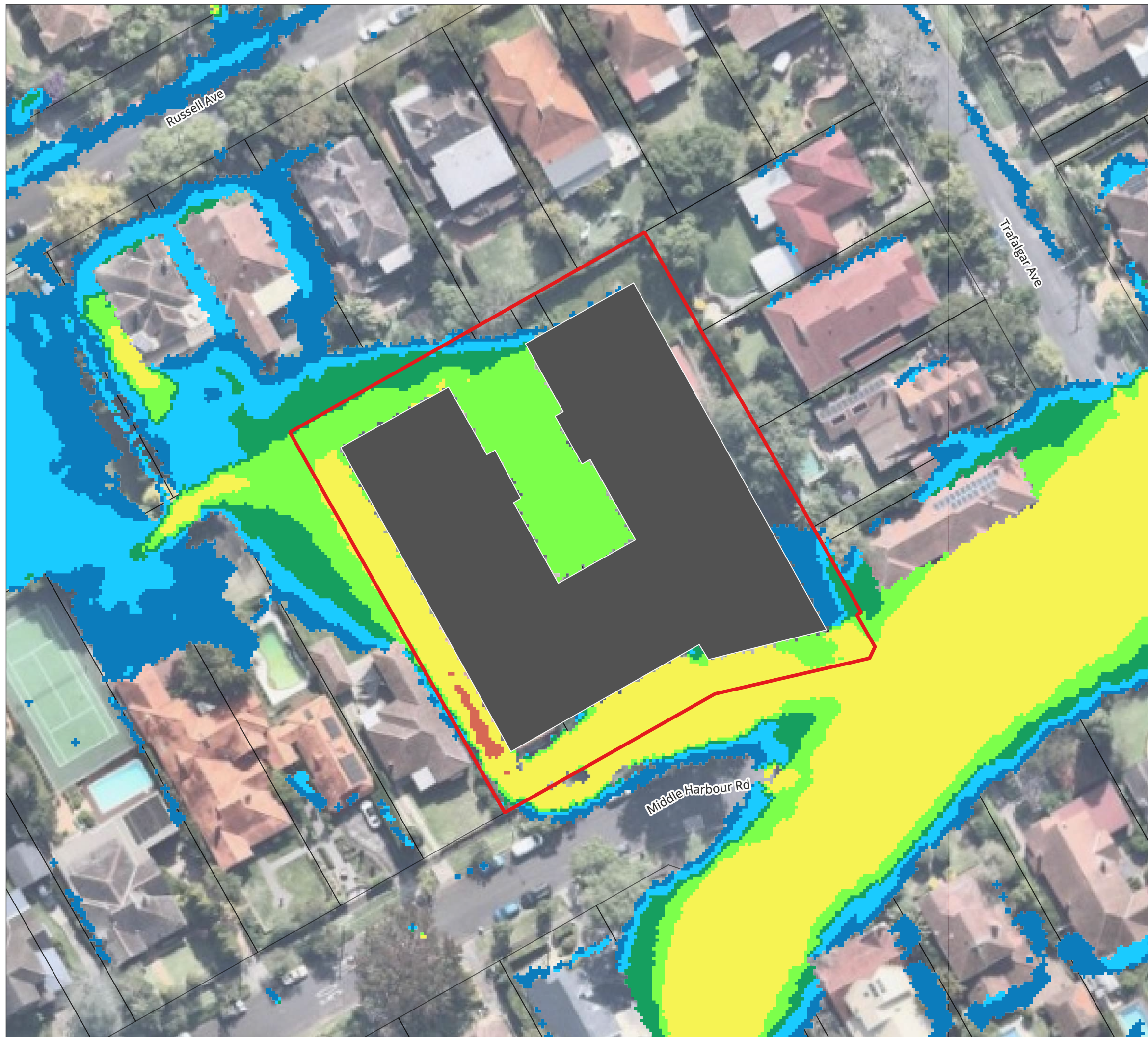
CIVIL | WATER | ENVIRONMENT

Appendix B-33

Post-Development Flood Hazard Classification PMF

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Hazard Classification
- H1 - No Restrictions
 - H2 - Unsafe for Small Vehicles
 - H3 - Unsafe for Vehicles, Children & Elderly
 - H4 - Unsafe for People & Vehicles
 - H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering Design
and Construction)
 - H6 - Not Suitable for People, Vehicles or Buildings



28 Middle Harbour Rd

Lindfield FIA



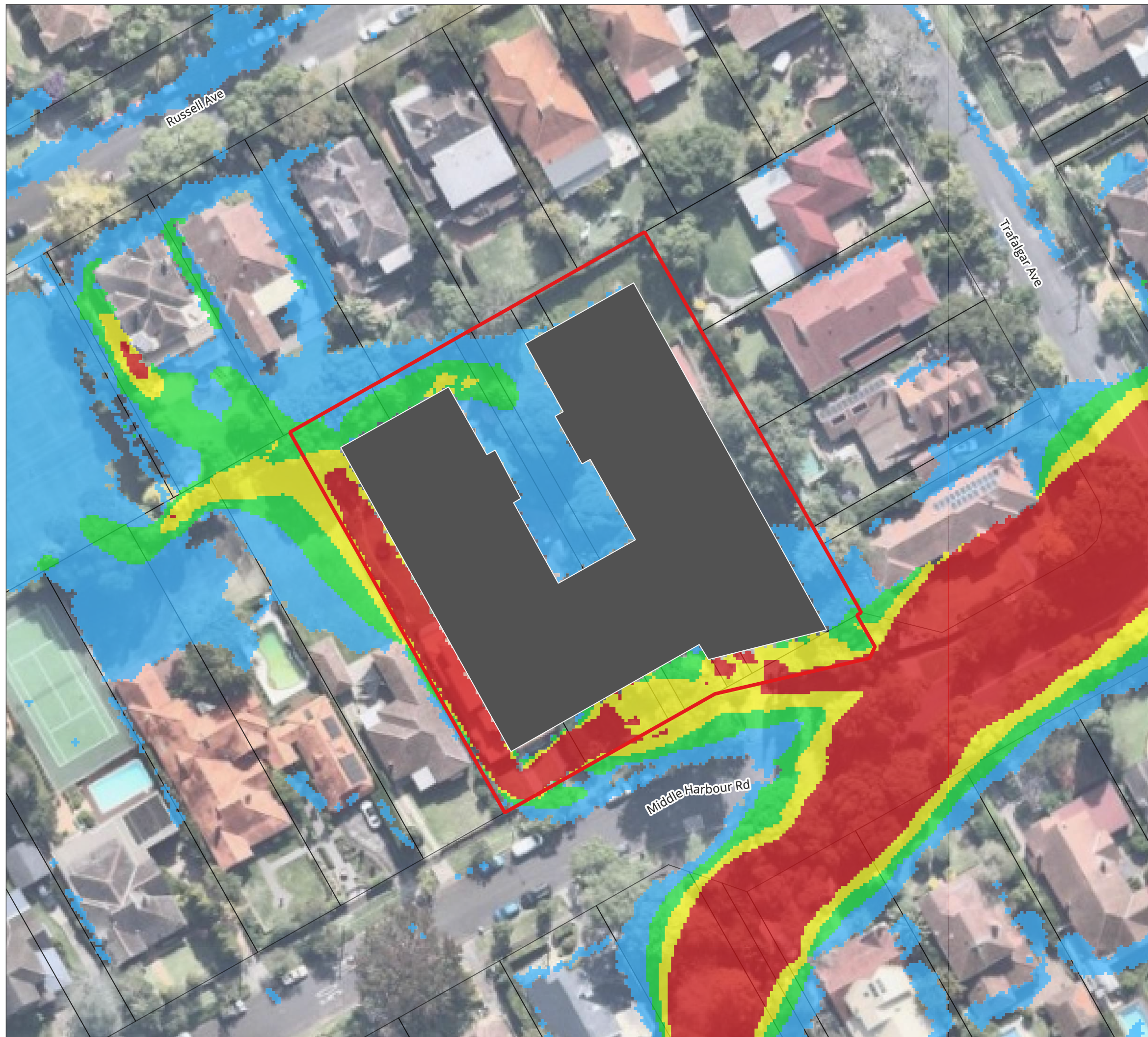
CIVIL | WATER | ENVIRONMENT

Appendix B-34

Post-Development
Peak Flood Depth * Velocity
PMF

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Peak Flood Depth x Velocity
- ≤ 0.4
 - $0.4 - 0.8$
 - $0.8 - 1.2$
 - > 1.2



28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



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Appendix B-35

Post-Development
Peak Flood Level Afflux
PMF

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre

Flood Level Afflux (m)

- ≤ -0.40
- 0.40 - -0.30
- 0.30 - -0.20
- 0.20 - -0.10
- 0.10 - -0.05
- 0.05 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- > 0.3
- Was Wet, Now Dry
- Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



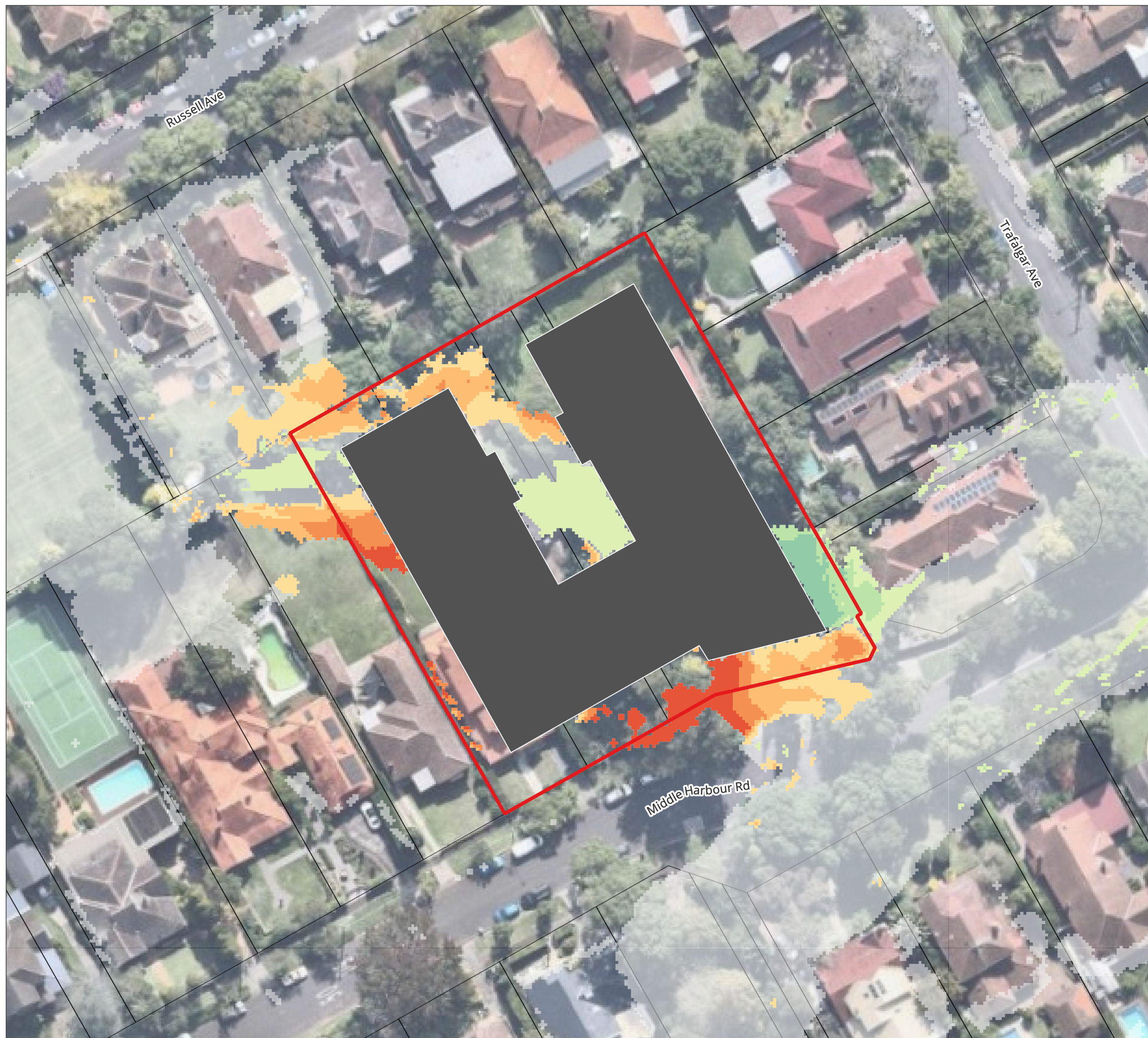
CIVIL | WATER | ENVIRONMENT

Appendix B-36

Post-Development
Peak Flood Hazard Afflux
PMF

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Hazard Afflux
- 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - Was Wet, Now Dry
 - Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025

APPENDIX C

CLIMATE CHANGE SENSITIVITY MAPPING



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Appendix C-1

Post-Development
Peak Flood Level Afflux
Rainfall Increase (0.5% AEP vs 1%
AEP)

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - 0.40 - -0.30
 - 0.30 - -0.20
 - 0.20 - -0.10
 - 0.10 - -0.05
 - 0.05 - 0.05
 - 0.05 - 0.10
 - 0.10 - 0.20
 - 0.20 - 0.30
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



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Appendix C-2

Post-Development
Peak Flood Hazard Afflux
Rainfall Increase (0.5% AEP vs 1%
AEP)

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Flood Hazard Afflux
 - 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
- Was Wet, Now Dry
- Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600

Job No: 20345
Date: 01/12/2025



0 10 20 30 m



CIVIL | WATER | ENVIRONMENT

Appendix C-3

Post-Development
Peak Flood Level Afflux
Rainfall Increase (0.2% AEP vs 1%
AEP)

LEGEND

- Site Location
 - Proposed Building Footprint
 - Cadastre
- Flood Level Afflux (m)
- ≤ -0.40
 - 0.40 - -0.30
 - 0.30 - -0.20
 - 0.20 - -0.10
 - 0.10 - -0.05
 - 0.05 - 0.05
 - 0.05 - 0.10
 - 0.10 - 0.20
 - 0.20 - 0.30
 - > 0.3
 - Was Wet, Now Dry
 - Was Dry, Now Wet

28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



Job No: 20345
Date: 01/12/2025

0 10 20 30 m



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Appendix C-4

Post-Development
Peak Flood Hazard Afflux
Rainfall Increase (0.2% AEP vs 1%
AEP)

LEGEND

- Site Location
- Proposed Building Footprint
- Cadastre
- Flood Hazard Afflux
 - 5
 - 4
 - 3
 - 2
 - 1
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
- Was Wet, Now Dry
- Was Dry, Now Wet



28 Middle Harbour Rd

Lindfield FIA

A3 Scale: 1:600



0 10 20 30 m

Job No: 20345
Date: 01/12/2025